EXPORT NUMBER

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ADVERTISING INDEX—PAGE 164.

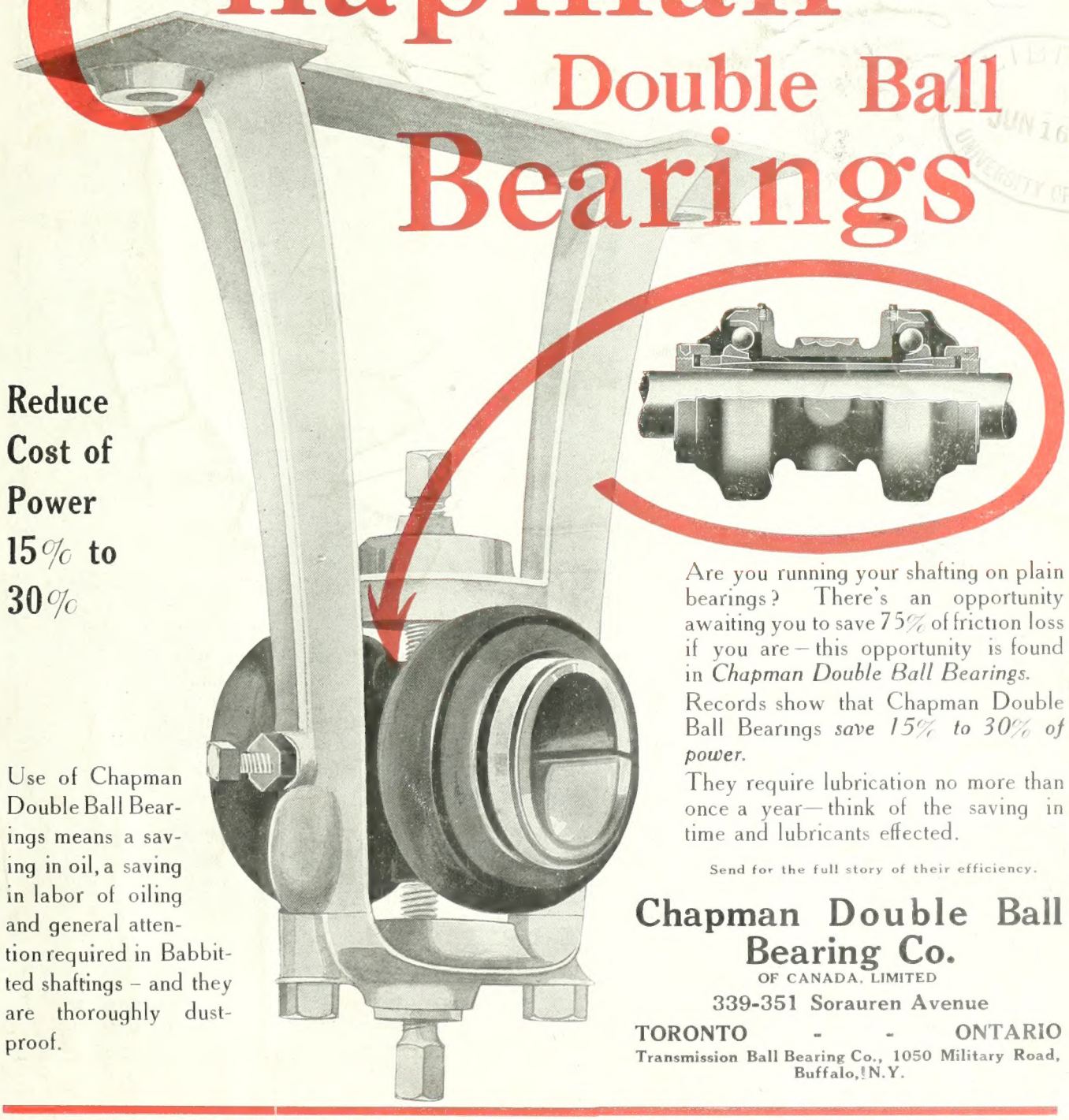
CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XVIII—No. 23 Publication Office: Toronto, December 6, 1917 Subscription Price $3.00 per Year

LIBRARY JUN 16 1922 UNIVERSITY OF TORONTO

Chapman Double Ball Bearings



Reduce Cost of Power 15% to 30%

Use of Chapman Double Ball Bearings means a saving in oil, a saving in labor of oiling and general attention required in Babbitted shaftings – and they are thoroughly dustproof.

Are you running your shafting on plain bearings? There's an opportunity awaiting you to save 75% of friction loss if you are – this opportunity is found in *Chapman Double Ball Bearings.*

Records show that Chapman Double Ball Bearings *save 15% to 30% of power.*

They require lubrication no more than once a year—think of the saving in time and lubricants effected.

Send for the full story of their efficiency.

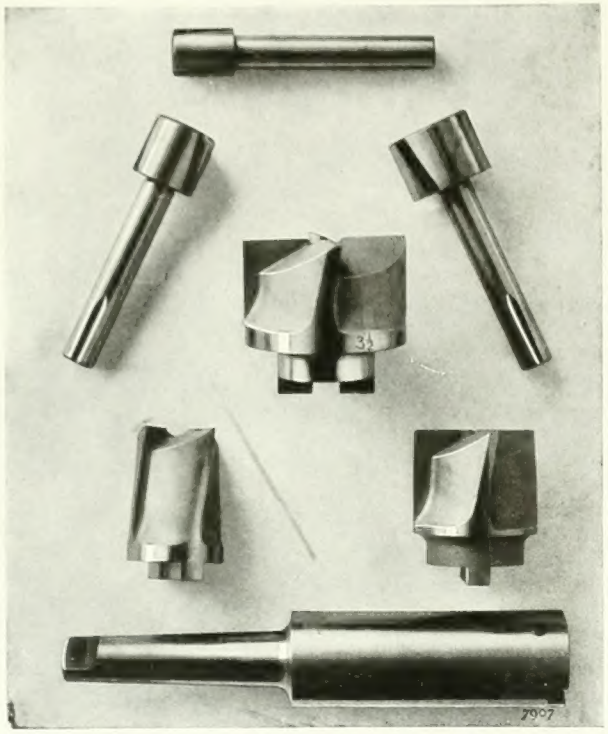
Chapman Double Ball Bearing Co.
OF CANADA, LIMITED
339-351 Sorauren Avenue
TORONTO - - ONTARIO
Transmission Ball Bearing Co., 1050 Military Road, Buffalo, N.Y.

SMALL TOOLS

Equip Your Tool Room With

PRATT & WHITNEY

Interchangeable Cutter Counterbores



and get the right combination at once.

HOLDER, CUTTER and GUIDE

With this combination you can immediately make the right combination for every counterboring job.

HOLDERS

End of holder is milled to receive the driving lug of the cutter, and there is also a hole and set screw to accommodate the shank of the guides.

GUIDES

Are of hardened tool steel. They are held in place by means of a set screw in the holder engaging a V-slot in the shank of the guide.

CUTTERS

Can be furnished of either carbon or high-speed steel.

The shank of the guide passes through the hole in the cutter and the shoulder between the guide and its shank keeps the cutter in place. Cutters can be sharpened on the face and the guide is simply pushed further in the hole after grinding.

Holders, Cutters and Guides are furnished in a wide range of sizes.

PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your order there to-day.

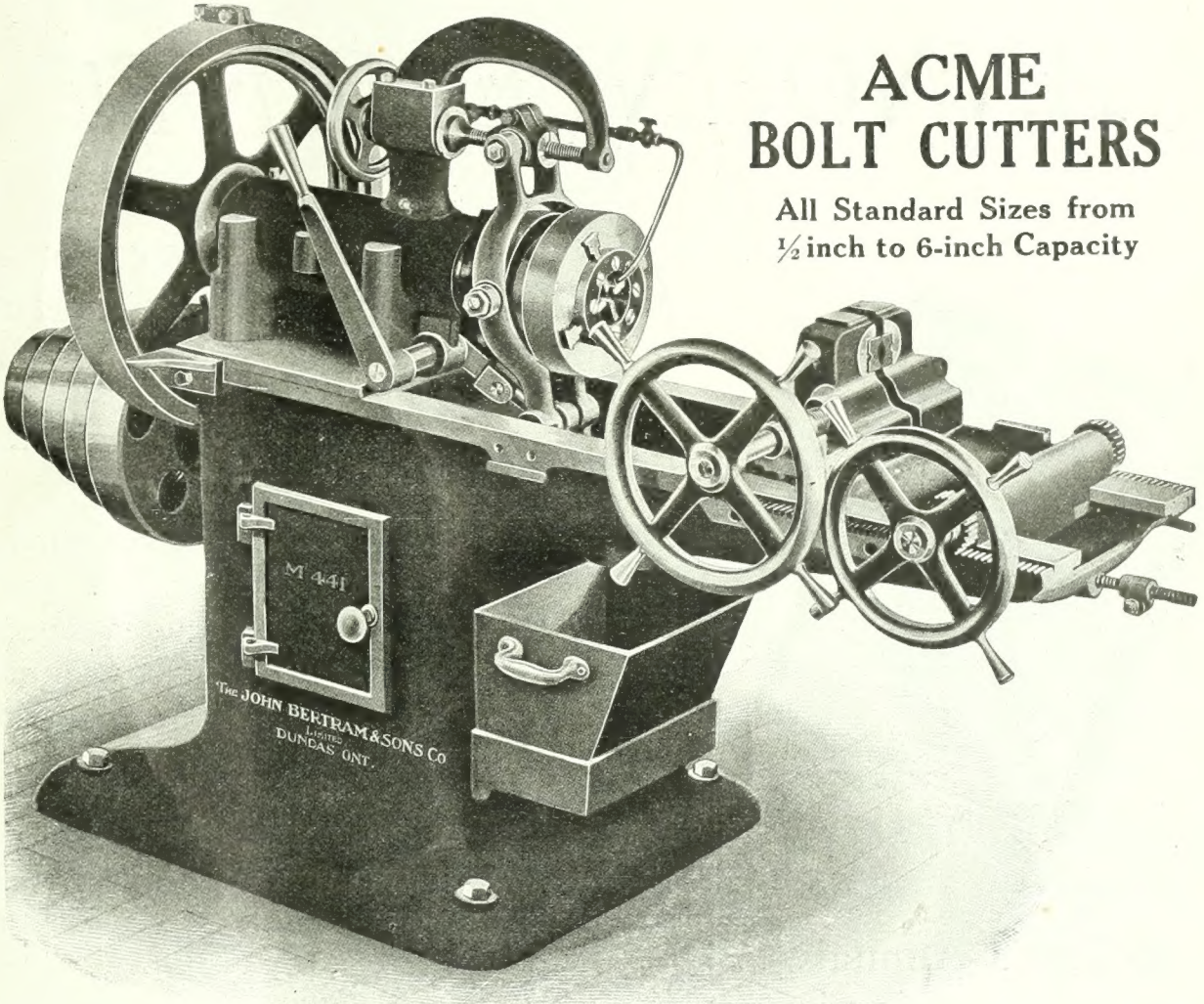
PRATT & WHITNEY CO.

of Canada, Limited

Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS



ACME BOLT CUTTERS

All Standard Sizes from ½ inch to 6-inch Capacity

Supplied with Leadscrew Attachment for Stay Bolts or other work requiring special Accuracy of Pitch.

WRITE US FOR FULL DETAILS ON ANY MACHINE OR MACHINES IN WHICH YOU ARE INTERESTED

The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL	TORONTO	VANCOUVER	WINNIPEG
723 Drummond Bldg.	1002 C.P.R. Bldg.	609 Bank of Ottawa Bldg.	1205 McArthur Bldg.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Publisher's Page

TORONTO December 6, 1917

ANNOUNCEMENT!

Last Year's Annual Number contained 432 pages — over 350 advertisers.

AS our Annual Review and Directory Number will be even larger than last year's record-breaker forms must close earlier than on former Annual Numbers.

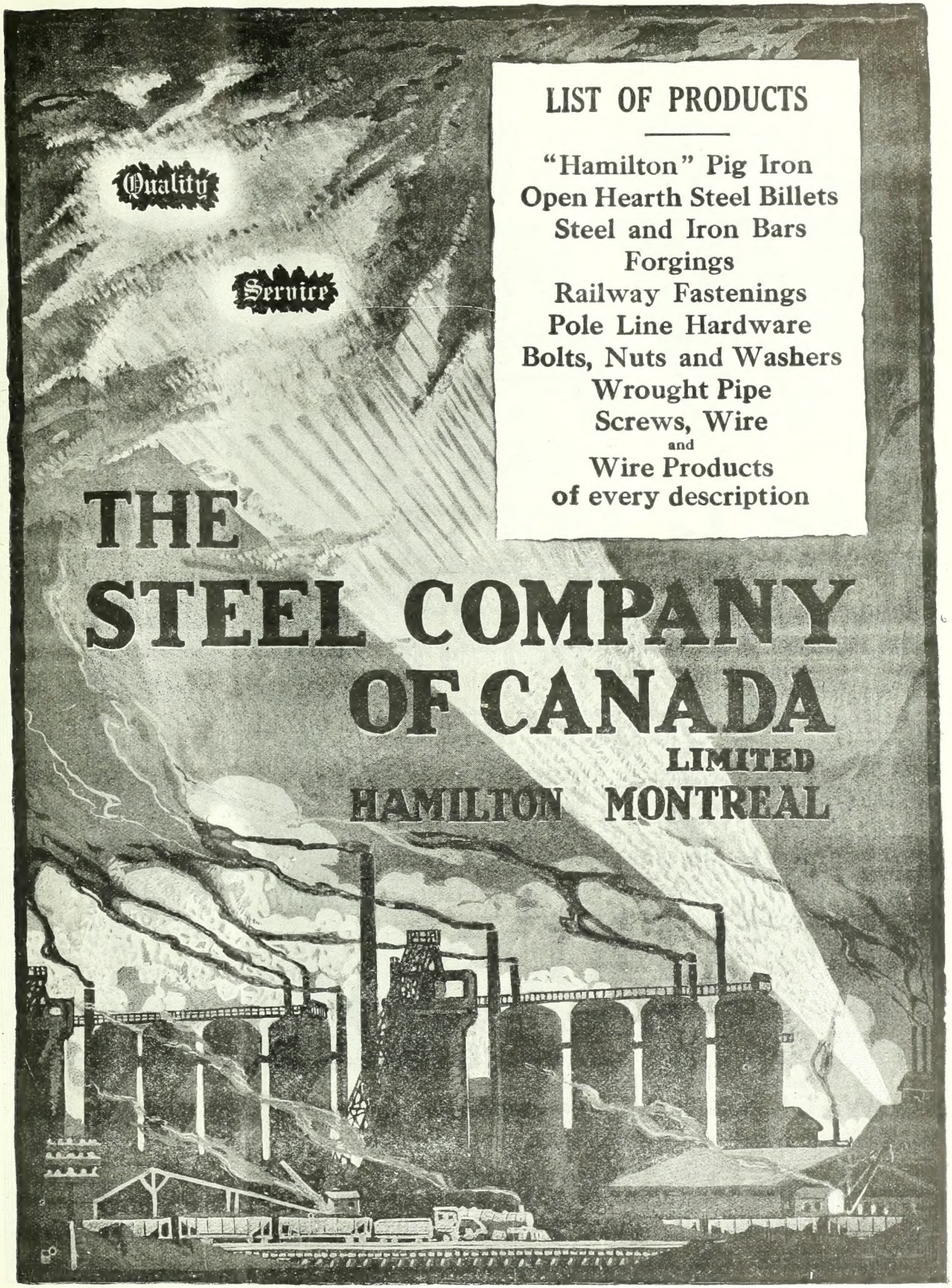
Many firms already have received proofs of their advertisements and some have gone to press. Do not procrastinate. Send in your space reservation, copy for your advertisement, the necessary cuts and a list of principal headings under which you would like to be classified.

Kindly send cuts by mail. Many advertisers were left out of last year's Annual Number simply because cuts were not received in time.

From a buyers' standpoint our 1918 Annual Number will be the most complete and valuable directory ever placed in their hands. It will be issued just at the commencement of a period of very heavy buying and will naturally influence a tremendous volume of business.

CANADIAN MACHINERY

143-153 University Avenue, Toronto, Canada



If any advertisement interests you, tear it out now and place with letters to be answered.

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK:

"WACO"

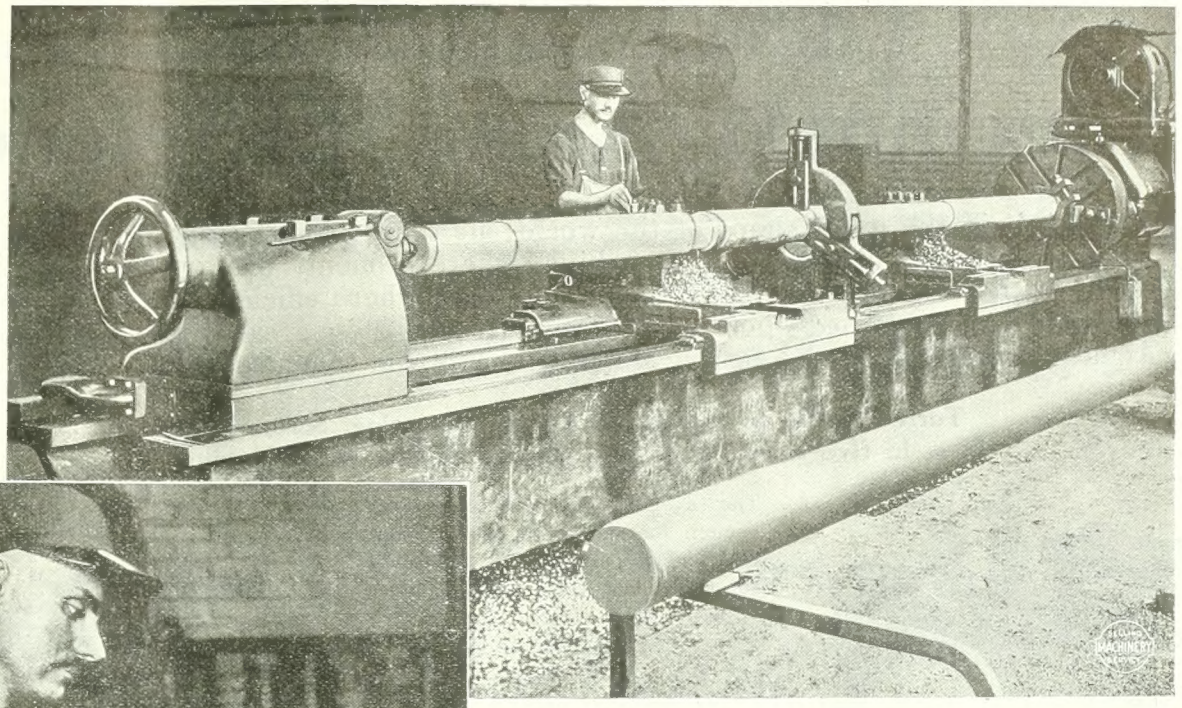
TRADE MARK:

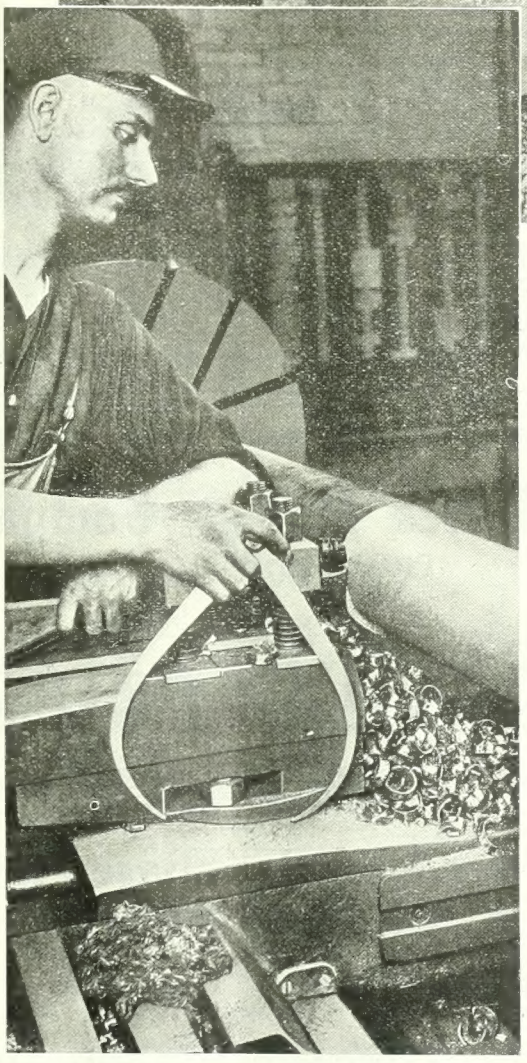
For particulars apply to our

Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario





The BRIDGEFORD LATHE

50-Point Carbon Steel Crucible Forgings and a Cut ½ Inch Deep

This is a rough turning job in which 1″ stock is taken off the diameter. Forging is 12′ in length and has three diameters—the smallest 5″, the largest 6½″. Cut is ½″ deep, feed is 0.054″ per revolution. Time, 6 hours.

This is but one of the jobs the Crucible Steel Forge Company, Cleveland, Ohio, handles on the Bridgeford Lathe. It is typical, however, of the work put up to the "Bridgeford."

Bridgeford Lathes are heavy duty machines, powerful, efficient, economical—the kind of machines you need if you have heavy turning of any kind.

The Bridgeford line includes lathes from 26″ to 60″ swing—each machine a time saver.

Ask for details.

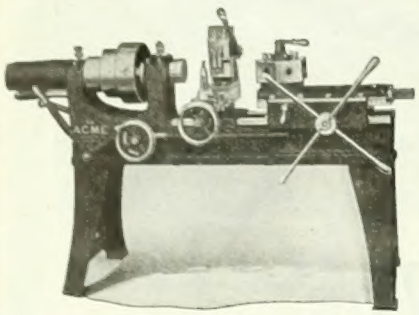
BRIDGEFORD MACHINE TOOL WORKS

151 WINTON ROAD **ROCHESTER, N.Y.**

It's a Long Stride to
Cincinnati Acme Efficiency

You see it in the great shops of the world; in those wonderfully organized shops where machine is pitted against machine, where economy ever guards against the slightest increase in established production cost, where efficiency in every sense is demanded and obtained—not just desired. It is in these great shops that Cincinnati Acme Turret Lathes and Screw Machines have won their laurels.

Turret Lathes in four sizes, 14" to 20" swing; Screw Machines in five sizes, 3/8" to 3/4" capacity and 11" to 20" swing.

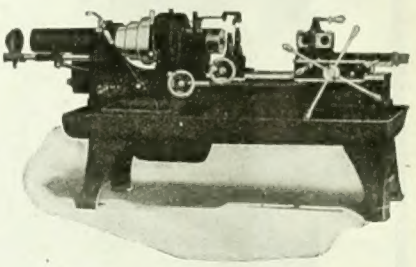


18" Forming Turret Lathe

The average machine may be good enough for the average shop—but is it good enough for yours? At least write for Cincinnati Acme Catalog and decide with the facts before you.

The Acme Machine Tool Co.
Cincinnati, Ohio, U.S.A.
Code Word: ACME

CANADIAN AGENTS: RUDEL-BELNAP MACHINE CO., MONTREAL, TORONTO



2¼" x 11" Screw Machine

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

SISCO

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

James McKay Company
Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN
King Edward Hotel, TORONTO

MALLEABLE CASTINGS

Capacity

Two Thousand Five Hundred Tons per Month

Our Prices, Quality and Delivery are Right

Send Us Your Inquiries.

THE PRATT & LETCHWORTH COMPANY, Limited

P.O. BOX 1630, MONTREAL

Works: BRANTFORD, ONTARIO

Air Chucks for 6" Shells in Stock

General Machine Work of All Kinds

Gear Cutting, Etc.

Hyde Engineering Works

27 William St., Montreal

P.O. Box 1185

Telephones: M. 1899 & M. 2527

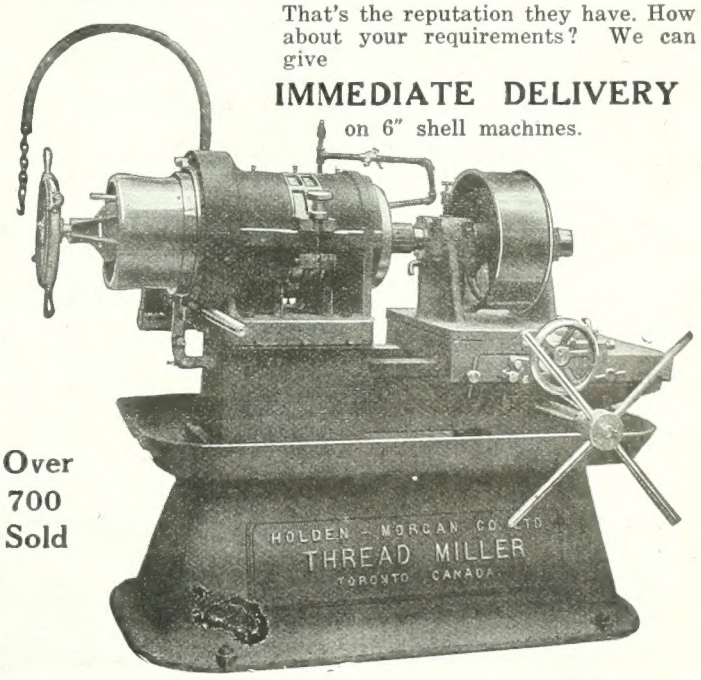
70 Holden-Morgans in One Plant

Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY

on 6" shell machines.



Over 700 Sold

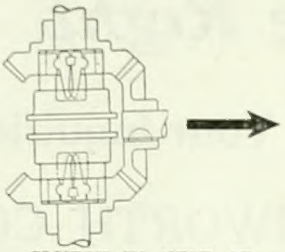
THE A. R. WILLIAMS MACHINERY CO.

W. FRONT ST. (Limited) TORONTO

If any advertisement interests you, tear it out now and place with letters to be answered.

The Johnson Friction Clutch Is Being Used As A Part Of This Machine

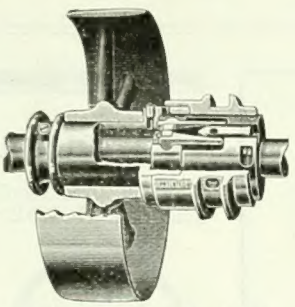
Follow the Arrow to the Snyder Drill Press



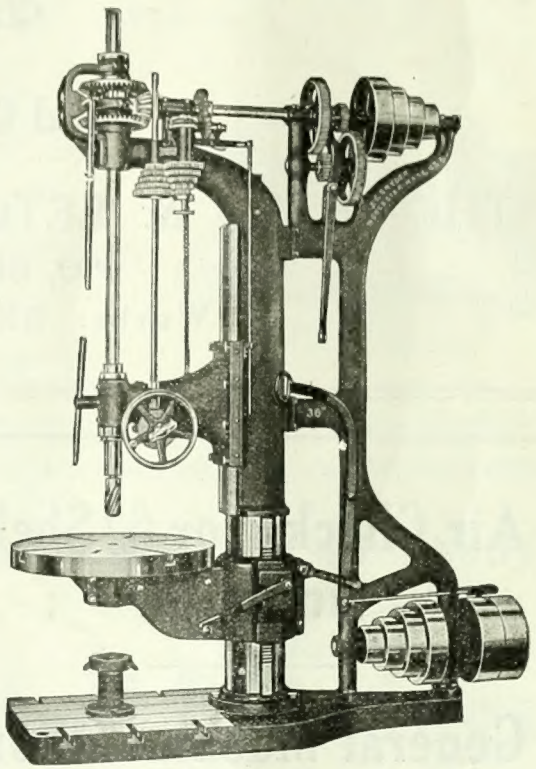
CLUTCH IN NEST OF GEARING.

A Double Johnson Friction Clutch is incorporated in the nest of gears indicated by the arrow.

Johnson Friction Clutches are compactly constructed and are mechanically designed to meet the requirements as a tapping device on all types of drill presses. Machines equipped with a Johnson Friction Clutch do not need any other tapping device.



CLUTCH WITH PULLEY MOUNTED ON HUB.



Courtesy of J. E. Snyder & Son, Worcester, Mass.

Consult Our Engineering Department for a Solution to Your Problems

There are a great many little problems that confront the machine tool designer. Why not consult our engineers and get the benefit of their years of experience in all branches of clutch application. This service is entirely free and is open to all without any obligation now or later.

Write for a copy of our yellow data sheets and latest booklet, "Clutches as Applied in Machine Building," to-day.

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

We will Fill Your Requirements *Send Us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements

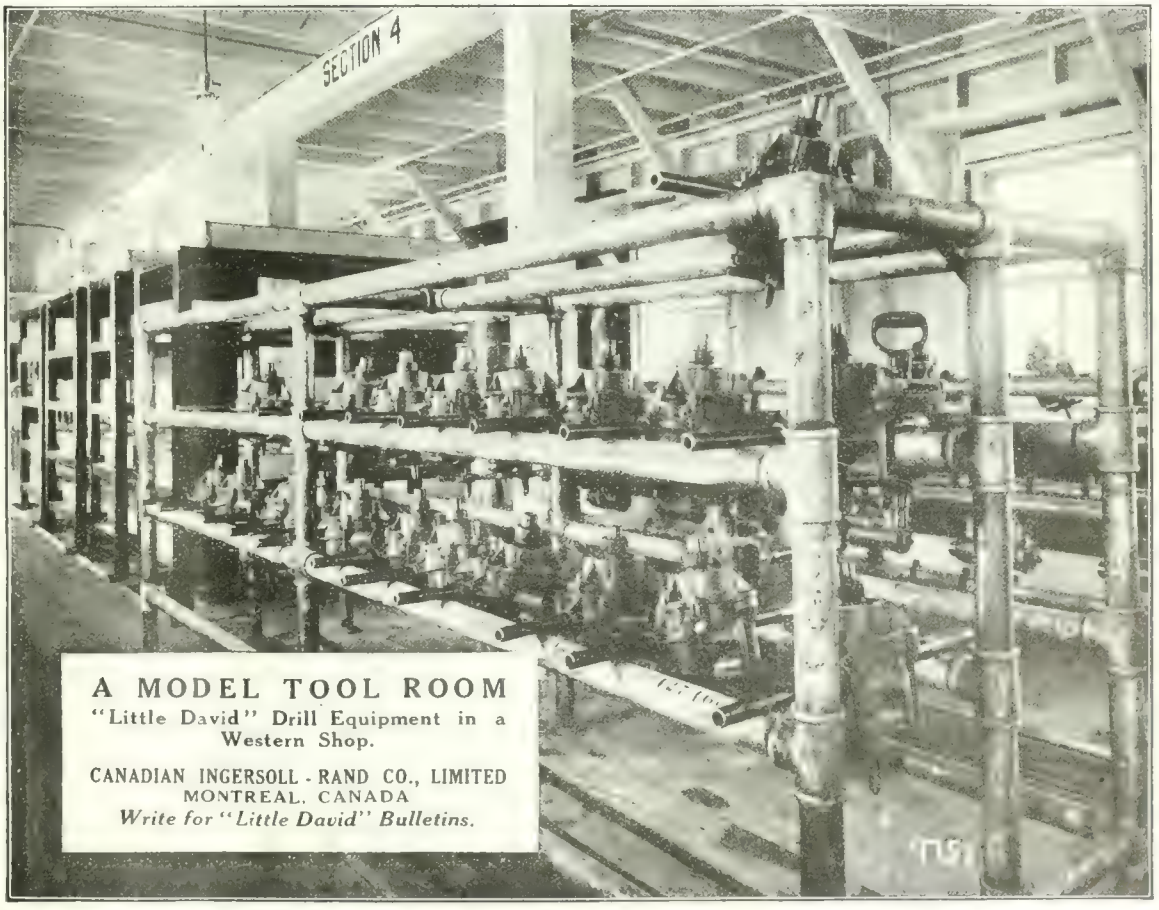
The Jenckes Machine Company, Limited

CANADIAN SALES OFFICES:

WORKS: Sherbrooke, Que.

Sherbrooke, Montreal, St. Catharines, Toronto
Cobalt, South Porcupine, Vancouver.

WORKS: St. Catharines, Ont.



A MODEL TOOL ROOM

"Little David" Drill Equipment in a Western Shop.

CANADIAN INGERSOLL-RAND CO., LIMITED
MONTREAL, CANADA
Write for "Little David" Bulletins.

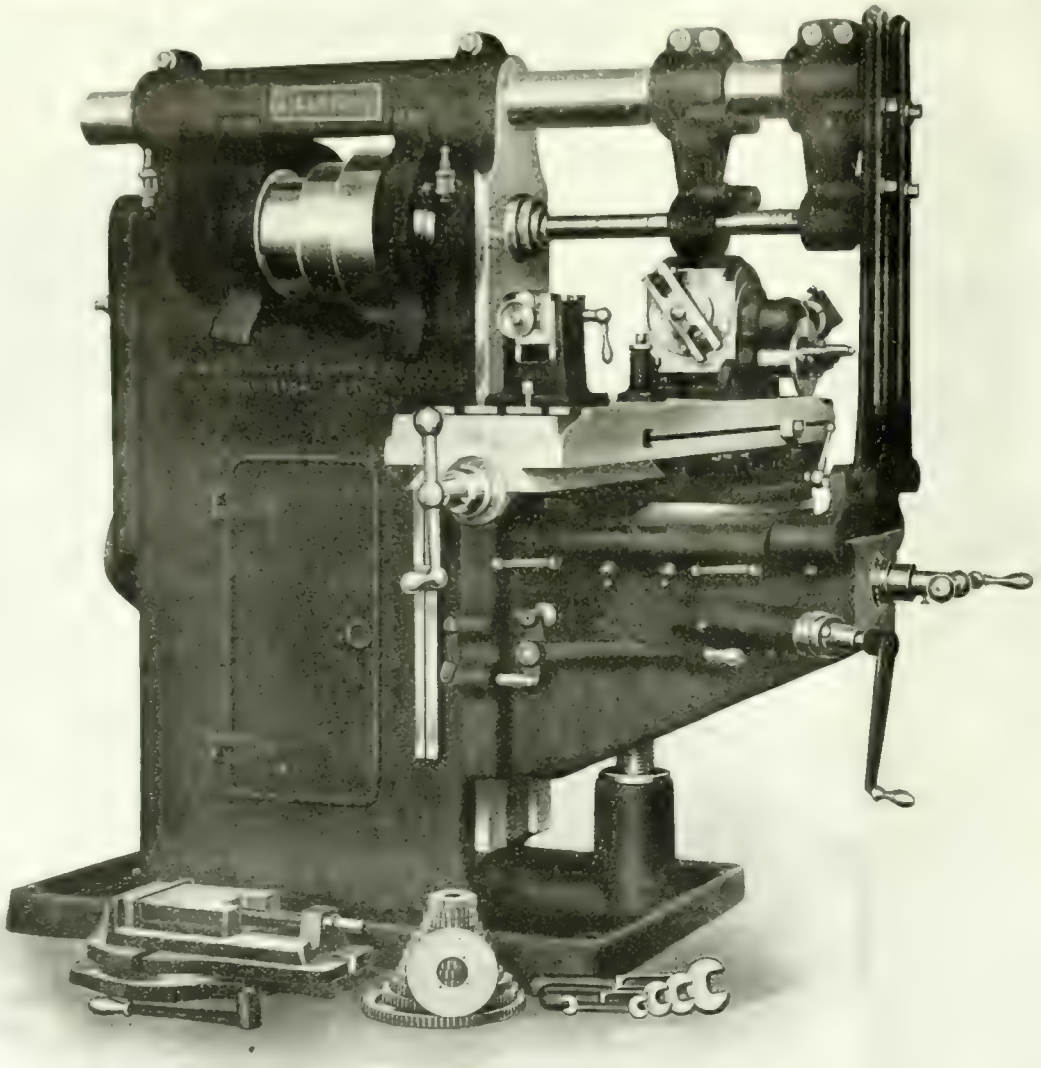
If any advertisement interests you, tear it out now and place with letters to be answered.

The Ford-Smith Machine Company

Adv't. No. 9 MILLER SERIES

OUR UNIVERSAL MILLERS

In this issue we cover our Universal Millers only. Compactness and simplicity of design have been strictly adhered to. All the points of excellence and accuracy of our Plain Millers are embodied in our Universal Machines, with all the new advantages that a Universal Miller allows one to have.



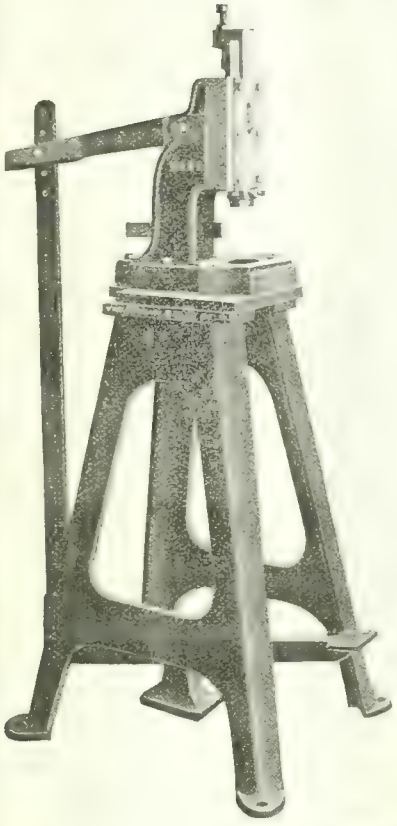
Our best workmanship and material are as heretofore placed on these machines. Purchasing Agent, Manager, Superintendent or Tool Room Foreman, allow us to send you our Bulletin so you can learn further the details of these machines.

It will pay you in the end.

The Ford-Smith Machine Company, Limited
HAMILTON ONTARIO CANADA

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

WHY A "B. B.?"

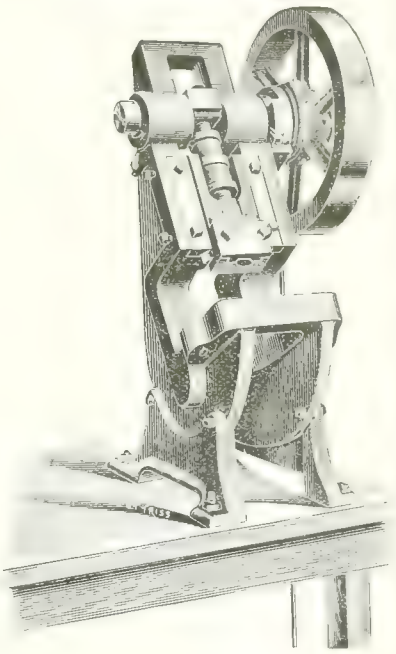


Experience has proved
that

B.B. PRESSES

qualify for

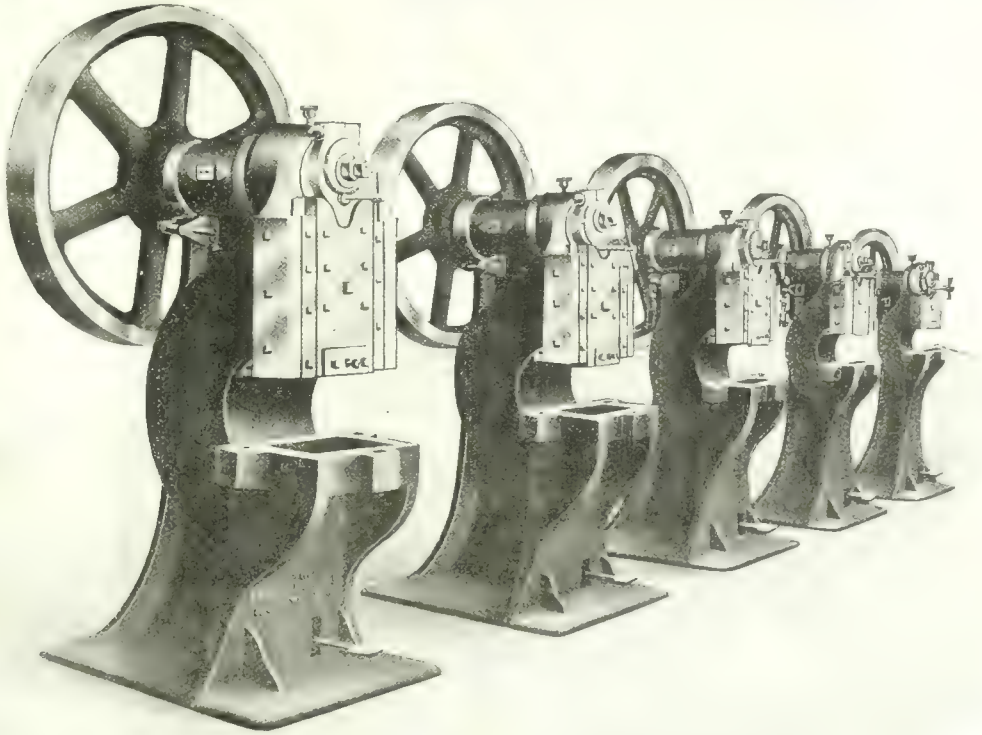
Economy
Durability
Speed



The Brown, Boggs Co.,

LIMITED

HAMILTON, ONT., CANADA



If any advertisement interests you, tear it out now and place with letters to be answered.

LANDIS

DIAMOND

NORTON

All sizes, finest quality, awaiting your command, stones

"THAT SUIT"

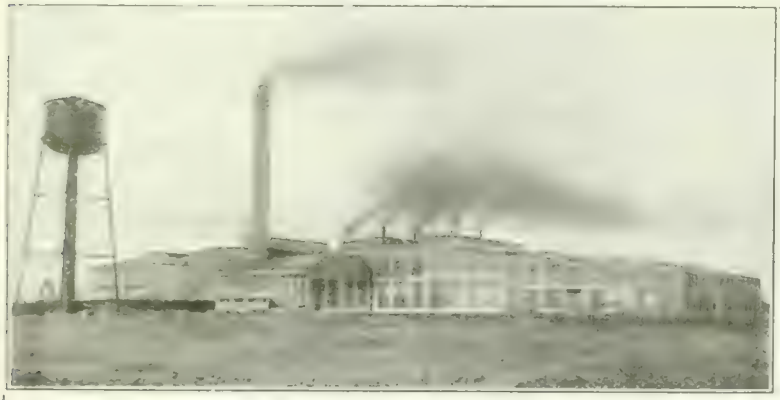
either unmounted or mounted in our improved (any style) CAST STEEL MOUNTING;

GUARANTEED TO BRING RESULTS.

"MADE IN CANADA"

WHEEL TRUEING TOOL CO.

88 WEST PITT STREET WINDSOR, ONTARIO



Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited

Standard Sizes of

HIGH SPEED STEEL

Carried in Stock

CARBON AND ALLOY STEELS

Shop Tools, Gauges, etc.

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

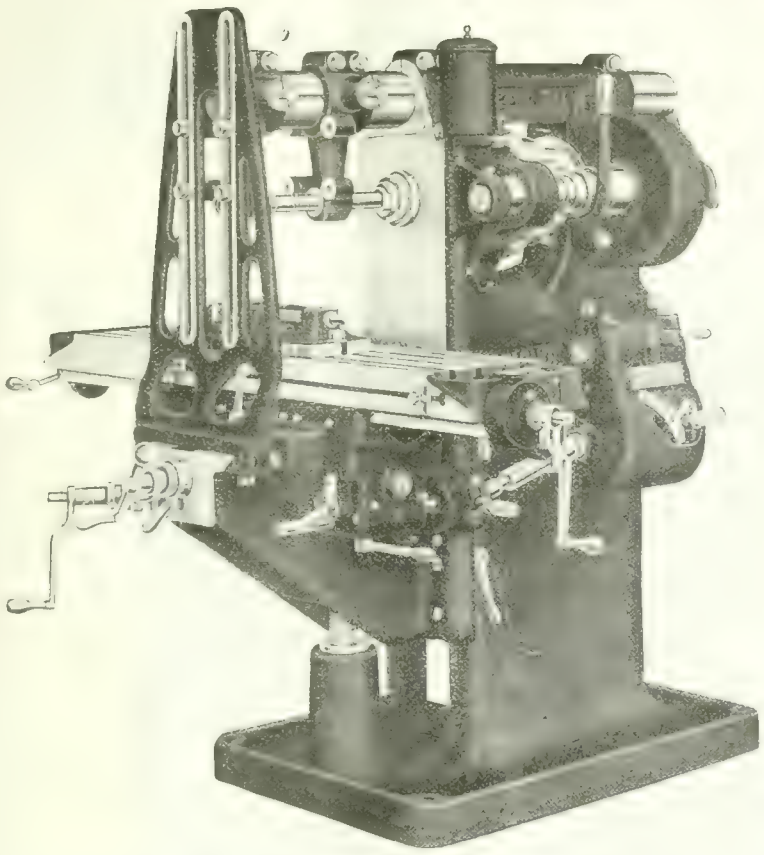
M.A. HANNA & CO.

Sales Agents, CLEVELAND

Canadian Office:

703 C.P.R. Bldg., Toronto

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



LeBLOND
Heavy Duty Milling Machines

Plain or Universal Types—Cone or Gear Drive. All commercial sizes No 0 to No. 5.

Adapted for the Heaviest Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.

Patent Self-Aligning Arbor Supports—
Hardened Steel Spindle Bearings—
Double-Friction Back Gears—and the simplest type of right-hand control, contribute to an increased production and longer life as a precision machine.

The R. K. LeBlond Machine Tool Company
CINCINNATI, OHIO, U.S.A.

URANIUM
HIGH SPEED STEEL
Improving High Speed Steel

When high speed steel was first produced it was so much better than carbon steel then in use that people thought it perfect. With the addition of Uranium to high speed steel, however, the combination was found to be stronger, tougher, held its cutting edge longer, especially on the higher speeds, and was more ductile than plain tungsten steel.

Repeated orders have shown what people think of Uranium Steel

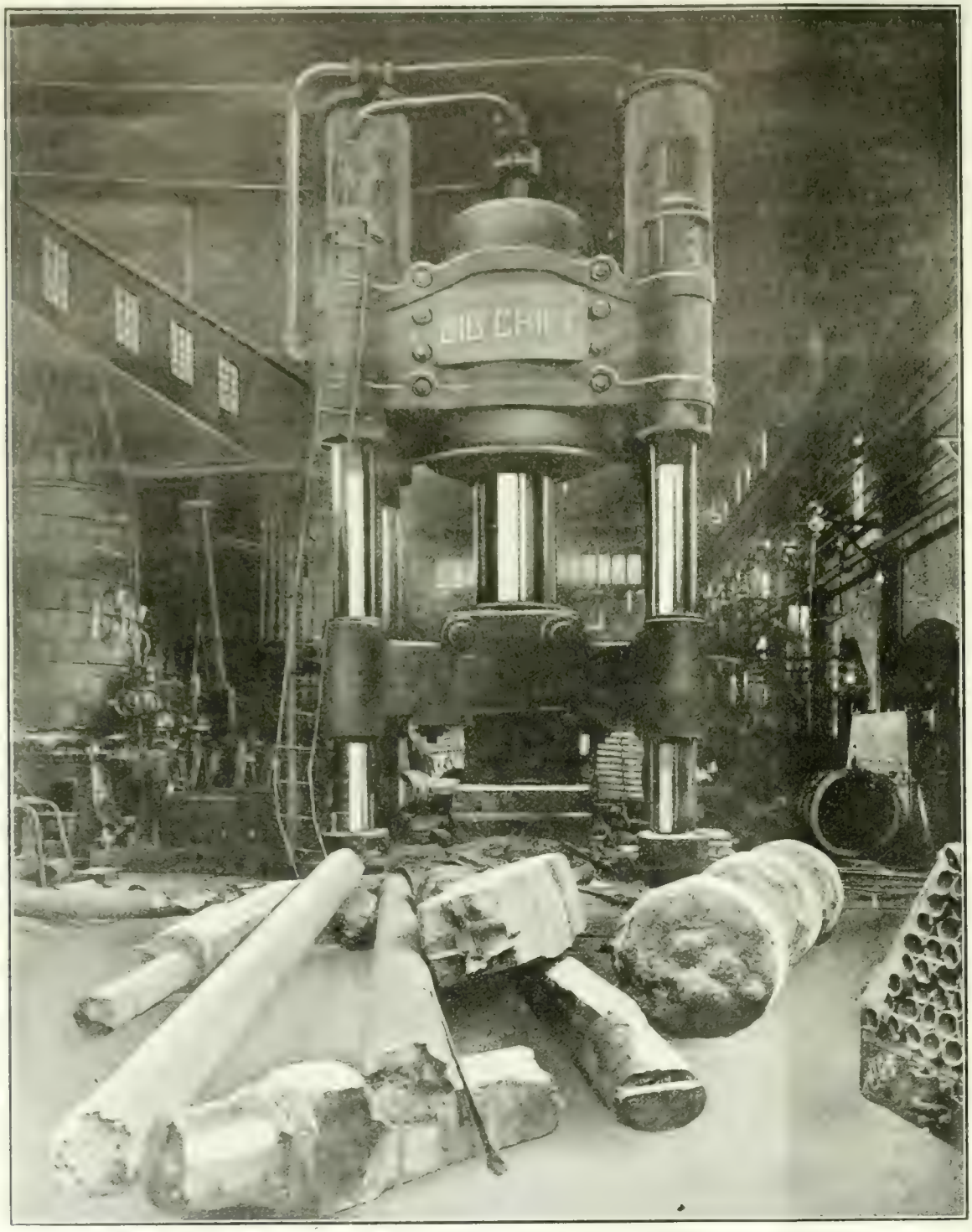
Consult your steel maker or write us.

STANDARD ALLOYS COMPANY
FORBES AND MEYRAN AVES.
PITTSBURGH, PENNA.

Nova Scotia Steel & Coal Company

Limited

New Glasgow, Nova Scotia, Canada



4,000 TON STEAM HYDRAULIC FORGING PRESS FOR MARINE AND OTHER HEAVY FORGINGS.

The product of a modern steam-hydraulic press is denser and more homogeneous than can be obtained with the steam hammer, due to the effect of the blow of the latter not penetrating to the centre, in contradistinction to the uniform kneading effect of the press; while the amount of work that can be done by the latter at one time with little variation in temperature, strongly tends toward a better product. The greater uniformity and reliability of steam hydraulic forgings make their use imperative wherever high-class products are required.

17 Years in the Service of Our Customers

You, as a user of TOOL STEEL, are vitally concerned with the Company manufacturing that steel. Obviously, for on it necessarily depend the quality of the Steel and the Service you receive.

THE VULCAN CRUCIBLE STEEL COMPANY was established in 1900 and has enjoyed a steady, normal growth—the result of satisfied customers. The personnel consists of experienced, executive and practical men who have worked together for years. The equipment of the plant is modern and complete, and assures you of prompt, dependable service. Natural gas, oil and electricity for melting; steam and electricity for mill driving, etc.

This Company has always conscientiously cared for the needs of its customers. In view of the conditions that have prevailed during the last two years, this is certainly a record of which to be proud.

These are some of the points that make relations with our customers so pleasant, and which are making the bonds of friendship and good-will stronger every day.

VULCAN CRUCIBLE STEEL COMPANY

MAKERS OF WOLFRAM HIGH SPEED STEEL

ALIQUIPPA *Established 1900* **PA., U.S.A.**

REPRESENTED IN CANADA BY

Messrs. Norton, Callard & Company, Montreal, Que.

If any advertisement interests you, tear it out now and place with letters to be answered.

For Export and Import—

Iron — Steel — Metals

Machinery, Raw Products and Manufactured Goods

A. G. KIDSTON & CO.

with offices in

LONDON GLASGOW MONTREAL NEW YORK
AUSTRALIA NEW ZEALAND SOUTH AFRICA

and connections all over the civilized world, have exceptional advantages for the marketing of Canadian and other products. Enquiries invited and promptly handled.

Manager for Canada and U.S.A.:
C. E. GAUSDEN, 17 ST. JOHN STREET, MONTREAL

Cables: "KIDCO," Montreal

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office and Warehouse, Canada and U.S. — 128 Craig Street West, Montreal
Ontario Office and Warehouse — 36 Colborne Street, Toronto
Winnipeg Stock — Dominion Equipment & Supply Co. Limited
Vancouver Stock — Frank Darling & Co.

W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

OUR GOVERNMENT will spend a minimum of $350,000,000 for Destroyers—when these are built the American Navy will lead the world in boats of this type and the submarine is doomed. Nothing but the best materials will enter into the construction of these vessels. *This is also true of*

"Red Cut Superior"

The Nationally Known
First Quality

HIGH SPEED STEEL

The greatest vigilance is observed in every detail of its manufacture—we spare no expense to insure the highest quality in every bar. No better all purpose High Speed Steel has as yet been produced.

It's best for all machine work.

VANADIUM-ALLOYS STEEL CO.
PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES

E. T. WARD'S SONS, 44 FARNSWORTH ST, BOSTON, MASS. | GEO. NASH CO, 304 HUDSON ST, NEW YORK, N. Y. | FIELD & CO. INC, 721 ARCH ST, PHILADELPHIA, PA. | VANADIUM ALLOYS STEEL CO, PITTSBURGH, PA. AND LATROBE, PA. | GEO. NASH CO, 646 WASHINGTON BLVD, CHICAGO, ILL.

U. S. S. Warrington, torpedo boat destroyer, the type of vessel that safely escorted Major General Pershing and his staff to England.

This is the type that is now aiding the British and French navies in wiping out the submarine menace. They are doing great work in lessening the effectiveness of the submarine warfare.

Passed by the Censor

If interested in High Speed Steel and you care to receive our printed matter at intervals, send us your name and address for our mailing list.

If any advertisement interests you, tear it out [illegible]

One of the

Steels of the Century

Centurion High-Speed

Made from the **BEST** Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the **BEST** Process

The Crucible Furnace Method

Handled by the **BEST** Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the **BEST** Work

Quality ***Delivery*** ***Service***

We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

General Office and Works:
POUGHKEEPSIE,
N.Y.

Sales Offices:
120 BROADWAY,
NEW YORK

THE FINEST QUALITY

HIGH-SPEED STEEL

IN EXISTENCE

BY using Uranium in our process of steel making, we have produced a truly remarkable combination of those two most desirable qualities, toughness and strength.

Through the consistent maintenance of quality, workmanship, and the exclusive use of automatically regulated furnaces, which eliminate all possible chance of human fallibility, we are able to produce a very high grade of High-Speed Steel.

"Electric-Uranium" has an exceptional cutting ability. It is increa-sing the users' output everywhere. Give it a trial.

We can make immediate deliveries on bars of regular sizes.

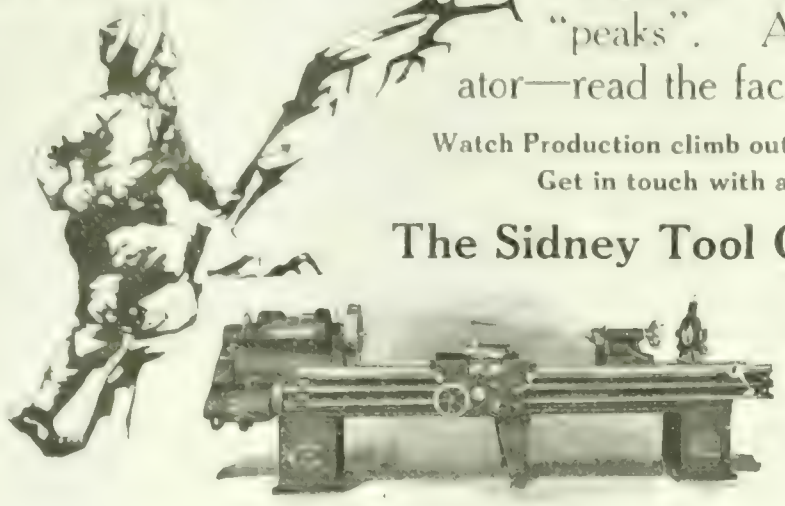
Latrobe Electric Steel Co.

LATROBE, PENNA.

WATCH PRODUCTION CLIMB OUT OF LATHES

FAMOUS

When Sidney-for-Service Lathes go into a plant, Production begins to climb up to new "peaks". Ask any "Sidney" Operator—read the facts in Bulletin No. 30.



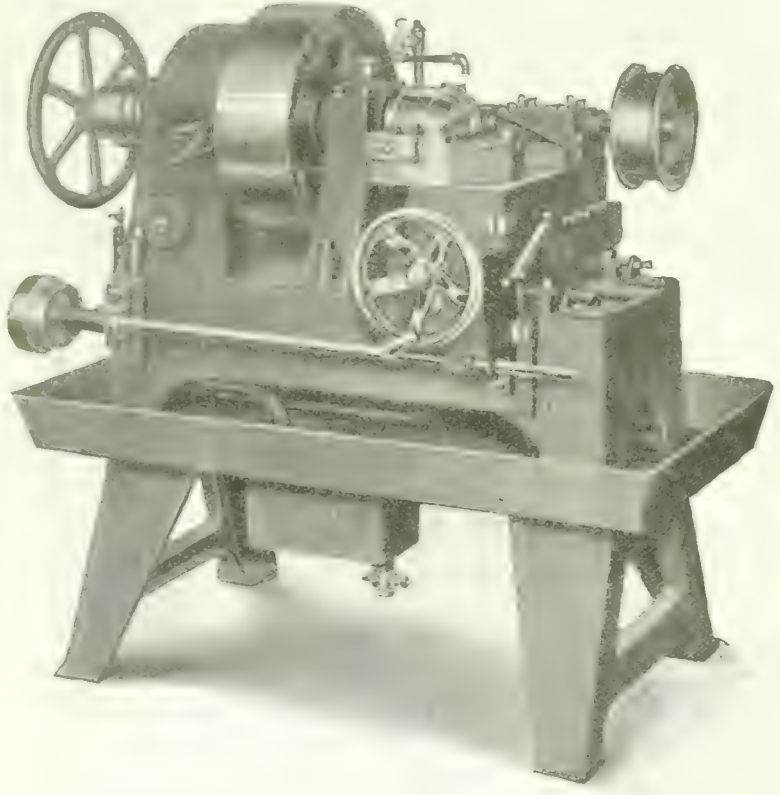
Watch Production climb out of Sidney-for-Service Lathes
Get in touch with a Canadian Agent now

The Sidney Tool Co. - Sidney, Ohio

Represented in Canada by

Foss & Hill Machinery Co.
Montreal, Que.

H. W. Petrie, Limited
Toronto, Ont.



For Turning, Facing and Milling the thread on Gas Check Plugs for 6-inch High Explosive Shells.

THE BANFIELD PLUG MILLER

Patented in Canada and United States

THIS machine is especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired, and milling the thread, all in one chucking, the complete plug being finished in six minutes by unskilled labor.

The machine is equipped with quick draw-in collet [illegible] with bronze bush having cut [illegible] for turning and facing. Worm gear [illegible] with cut jaw clutch for milling. [illegible] flanged pulley. The milling [illegible] driven by an 8" x 2½" flanged pulley. Top post carriage is equipped with power feed (two [illegible] have automatic stops). Power feed pump [illegible] driven from worm shaft (all drives [illegible] main countershaft). Rigidly built, simple and economical to operate.

Weight 1,800 lbs.

For 18 pdr., 15 and 60 pdr. High Explosive Shells. Can furnish machines of same type, but somewhat lighter in construction. Particulars on request. These machines are tooled up for finishing plain machined [illegible] beveled plugs, if desired.

Write for prices and deliveries.

Prompt Shipment

BUILT EXCLUSIVELY BY

Edwin J. Banfield
STAIR BUILDING, TORONTO, ONT.

Help Win the War

USE

STELLITE

Increase Your Production

The Hardest, Toughest, Fastest Cutting Metal Known

We shall be glad to send Demonstrator to show you how you can increase your production by using

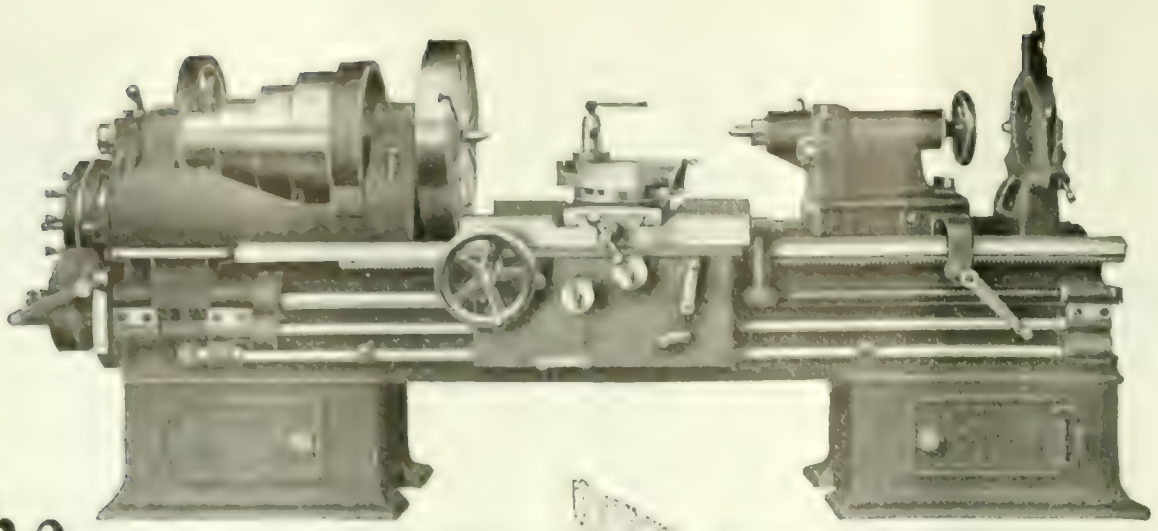
STELLITE

Deloro Smelting & Refining Company, Limited

Head Office and Works: DELORO, Ont.

Toronto, 200 King St. W. Montreal, 315 Craig St. W.

If any advertisement interests you, tear it out now and place with letters to be answered.



The "HAMIL TON"

Speeds Production

INSTALL the most modern machinery in your plant to meet the new conditions of to-day. You get it in Hamilton Lathes.

We are living in the greatest speed-up, cut-the-cost-of-production period of modern times. War time conditions demand speed and economy in the machine shop as well as in other institutions of commerce. Shops everywhere are now producing more work with the same force of men than before the war. The war has created a demand for the utmost efficiency and brought out the resourcefulness of the country in new machinery.

Hamilton Lathes represent the conditions in the machine shop and the spirit of the times with their speed, durability and accuracy.

Write now for Bulletins—yours for asking.

The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario:

H. W. PETRIE, Limited - TORONTO, ONT.

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

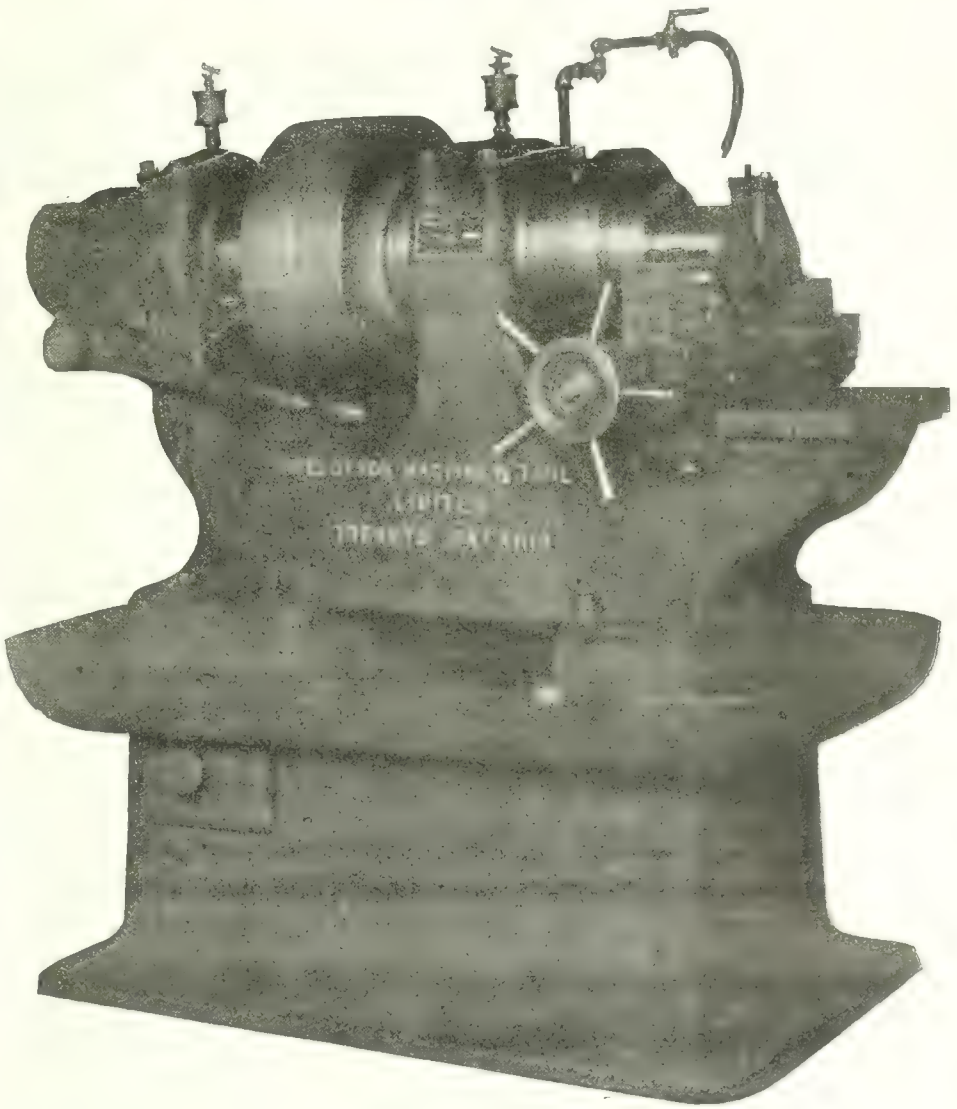
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



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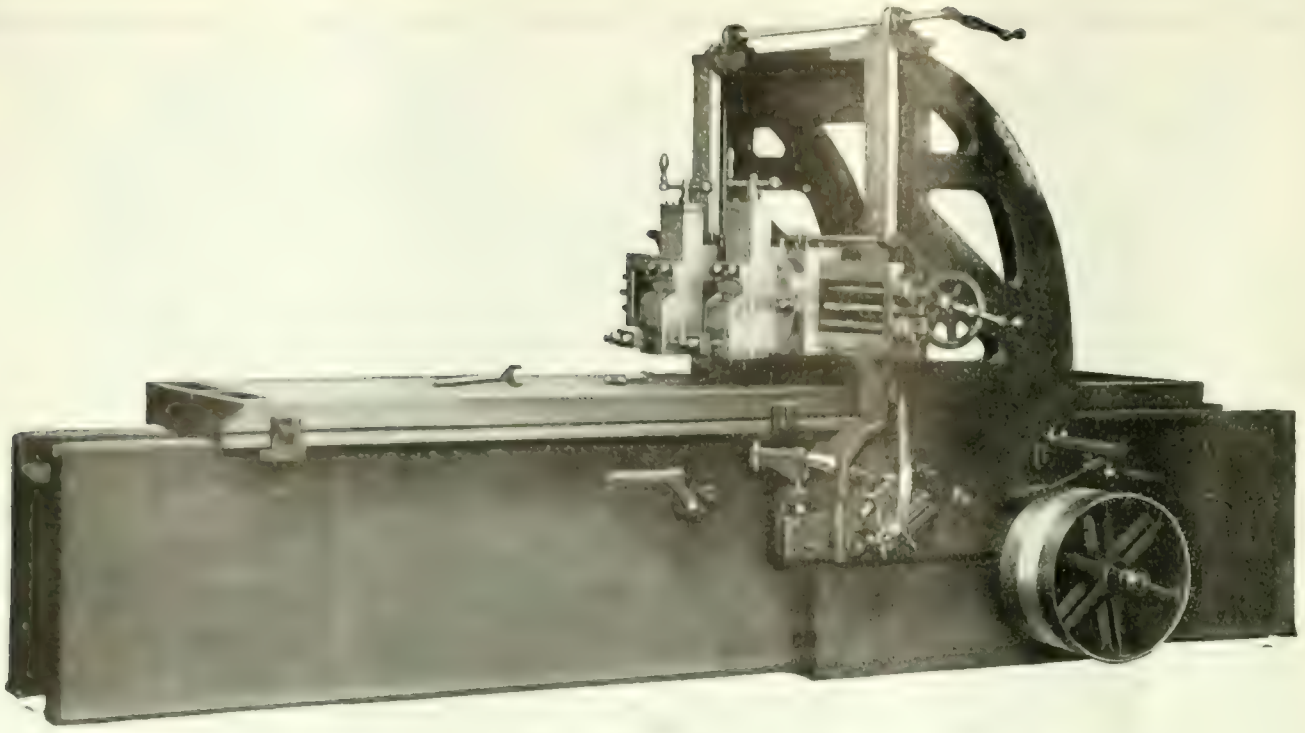


No Overhanging Table On The Whitcomb-Blaisdell Widened Planer

A great variety of planer work calls for unusual width between the housings, with but little height under the cross-rail.

This is the work for the widened pattern planer, rather than a standard machine. The former is easier to handle and capable of higher speeds.

The Whitcomb-Blaisdell Widened Planer has been developed to fill this need. Not a makeshift, built over from the standard size; but thorough and complete in design.

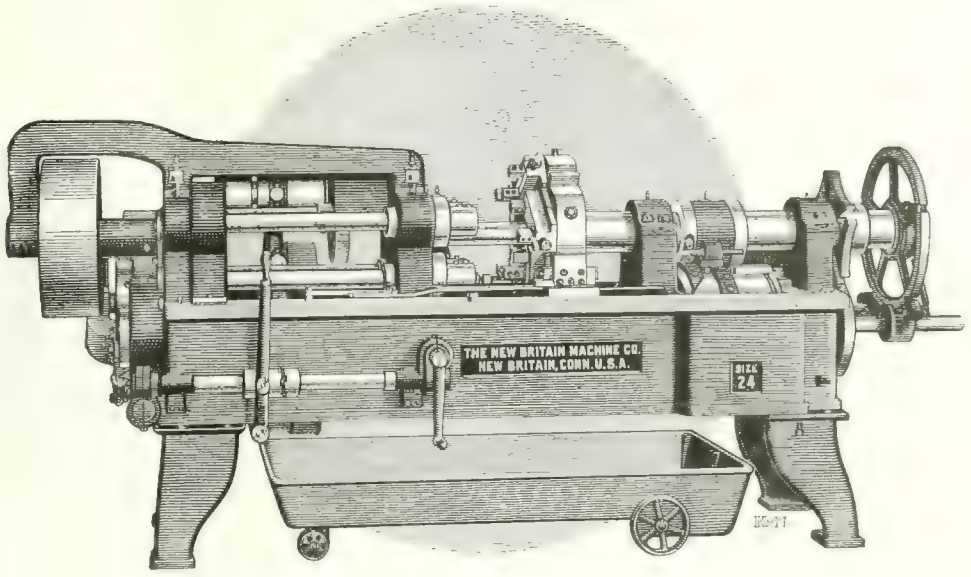
For instance the usual practice is to widen the bed and table without spreading the tracks thus causing overhang to the table. Whitcomb-Blaisdell design, however, widens the tracks as well. This is typical of Whitcomb-Blaisdell construction throughout. Every detail for production is built into these planers.

Write for the Whitcomb-Blaisdell Planer Book. Read all the details.

LATHES
From 14 to 30" SWING

WHITCOMB-BLAISDELL
MACHINE TOOL CO.
WORCESTER, MASS., U.S.A.

PLANERS
From 17" to 48" WIDE



A CASE OF NO CHOICE

WHEN you buy a lathe—milling machine—or what not—you have a wide field with which to acquaint yourself.

One lathe is best for small work, another for large. This miller possesses an exclusive feature rendering it most efficient for one purpose, that one for another. And so on.

To buy intelligently you must be familiar with the individual characteristics of a considerable number of similar machines.

The selection of equipment for the common run of chucked work—whether castings, forgings, or second-operation bar work—is rendered easy by reason of the fact that there is one machine which stands out above all others, with a 300% to 500% production advantage.

That's the "NEW BRITAIN" MULTIPLE SPINDLE AUTOMATIC.

There's no choice!

The New Britain Machine Company

Automatic Screw and Chucking Machines

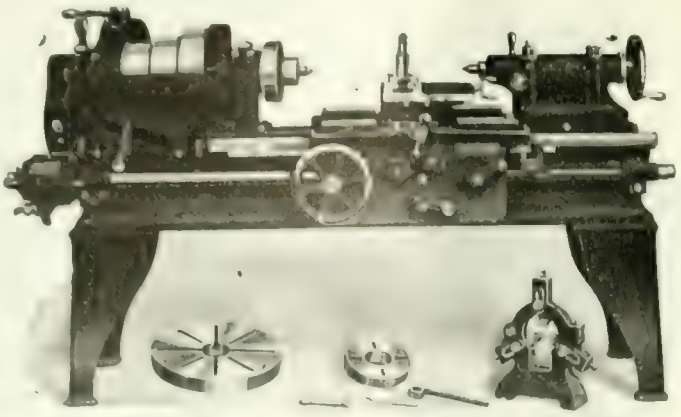
New Britain, Connecticut, U.S.A.

LOOK—Lodge and Shipley Engine Lathes

IMMEDIATE SHIPMENT

SIZE
14" x 6' or 8' Bed.

Double Back Gears and Quick Change Gear Box.



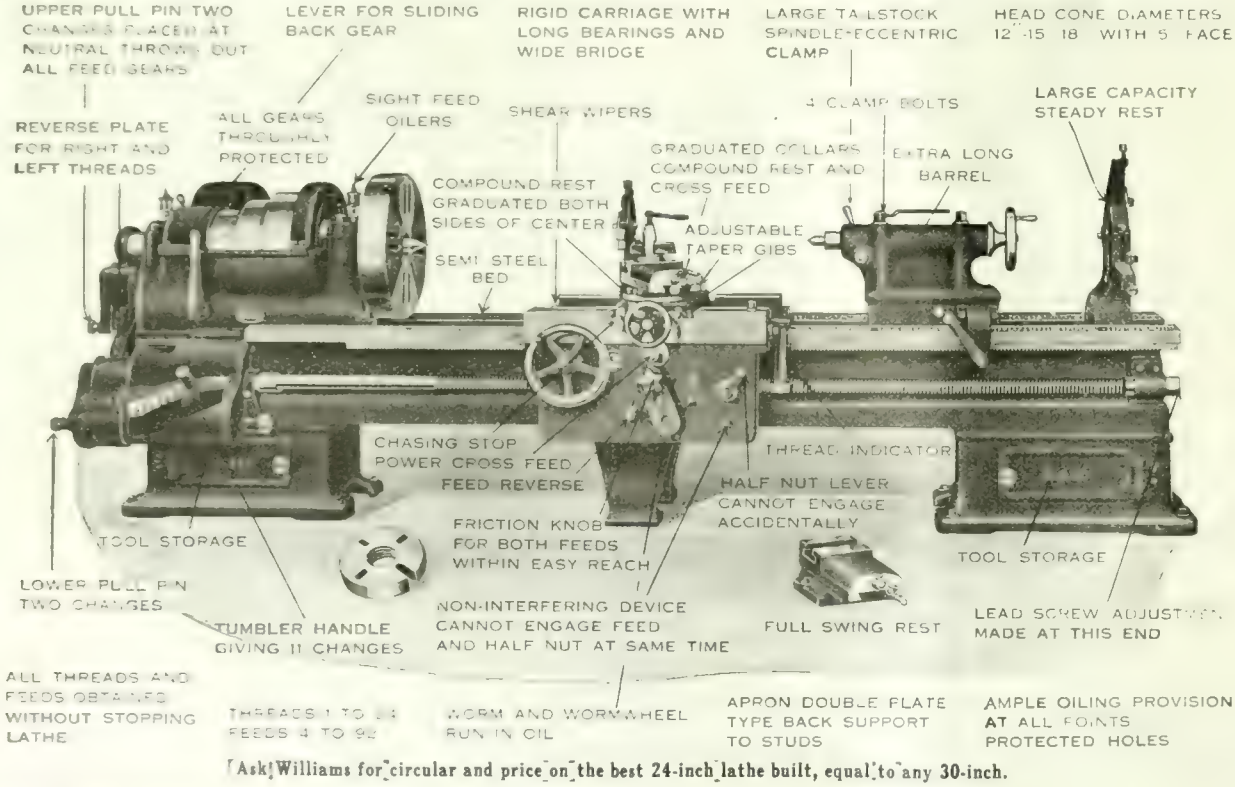
If you can use this size lathe, write for specifications and prices. Remember these are the highest quality tools manufactured.

GARLOCK-WALKER MACHINERY CO., LTD.

32 FRONT STREET WEST, TORONTO, ONT.

"EVERYTHING IN MACHINERY"

CISCO NEW 24" — THE LATHE WITH THE PULL


UPPER PULL PIN TWO CHANGES PLACED AT NEUTRAL THROWS OUT ALL FEED GEARS
LEVER FOR SLIDING BACK GEAR
RIGID CARRIAGE WITH LONG BEARINGS AND WIDE BRIDGE
LARGE TAILSTOCK SPINDLE-ECCENTRIC CLAMP
HEAD CONE DIAMETERS 12" 15 18 WITH 5 FACE
REVERSE PLATE FOR RIGHT AND LEFT THREADS
ALL GEARS THROUGHLY PROTECTED
SIGHT FEED OILERS
SHEAR WIPERS
4 CLAMP BOLTS
LARGE CAPACITY STEADY REST
GRADUATED COLLARS COMPOUND REST AND CROSS FEED
EXTRA LONG BARREL
COMPOUND REST GRADUATED BOTH SIDES OF CENTER
ADJUSTABLE TAPER GIBS
SEMI STEEL BED
CHASING STOP POWER CROSS FEED FEED REVERSE
THREAD INDICATOR
HALF NUT LEVER CANNOT ENGAGE ACCIDENTALLY
FRICTION KNOB FOR BOTH FEEDS WITHIN EASY REACH
TOOL STORAGE
TOOL STORAGE
LOWER PULL PIN TWO CHANGES
TUMBLER HANDLE GIVING 11 CHANGES
NON-INTERFERING DEVICE CANNOT ENGAGE FEED AND HALF NUT AT SAME TIME
FULL SWING REST
LEAD SCREW ADJUSTED MADE AT THIS END
ALL THREADS AND FEEDS OBTAINED WITHOUT STOPPING LATHE
THREADS 1 TO 24 FEEDS 4 TO 92
WORM AND WORM WHEEL RUN IN OIL
APRON DOUBLE PLATE TYPE BACK SUPPORT TO STUDS
AMPLE OILING PROVISION AT ALL POINTS PROTECTED HOLES

Ask Williams for circular and price on the best 24-inch lathe built, equal to any 30-inch.

THE CINCINNATI IRON & STEEL CO., Cincinnati, U.S.A., 14-in., 16-in., 18-in., and 24-in. Lathes

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

THE FACTORY SUPPLY AND STEEL COMPANY

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

DOUBLE

MUSHET

High Speed Steel

Carbon Steel

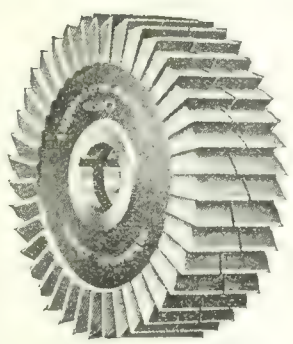
Gauge Steel

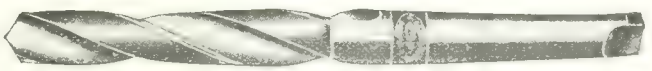
Alloy Steels

SOLE MAKERS

Samuel Osborn & Co. Ltd.

SHEFFIELD





Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)

Limited

Head Office and Works: Montreal, P.Q.

Branch Office: Toronto, Ontario

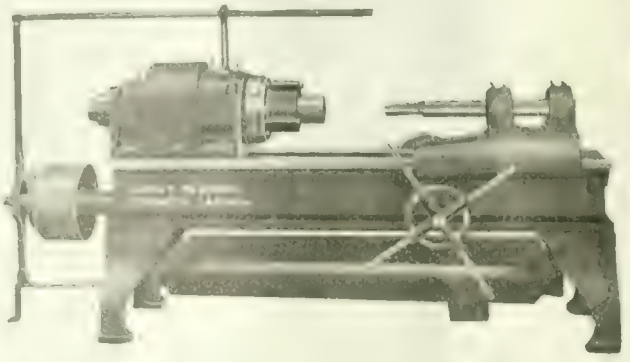
Boring 6" Shells

with

Perfectly accurate boring and far greater speed go into your shop the day you open the door to a Hepburn Single Bar Boring Lathe. A rigid build. No lathe in your shop or any shop other than a Hepburn lathe is its equal on 6" shell work. Write us a record.

Your old lathe rebuilt by us will be as efficient as new for all lathe work. Ask us particulars.

Hepburn Lathes



John T. Hepburn, Limited

18-60 Van Horne Street Toronto, Ontario

Where Shall We Send It?

Every Live Wire Man should have this booklet.

There are 40 pages full of good information on tool room grinding—cutters, reamers, drills, taps and dies, lathe and planer tools. It's yours for the asking. Just send us your address and a copy of this valuable little booklet will be mailed FREE of charge without any obligation to you.

Norton Company

Worcester, Mass.

ALUNDUM AND CRYSTOLON PLANTS:
CHIPPAWA, ONT. NIAGARA FALLS .N.Y.

Canadian Agents—The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria; F. H. Andrews & Son, Quebec, Que.

Use coupon, letter or postcard. Ask for Booklet 835-D

Norton Company, Worcester, Mass.
Please mail my copy of Booklet 835-D to the following address:

Name .....

St. & No. .....

City or Town .....

Reg. U. S. Pat. Office.

TEST PRESSES

For Applying Internal Pressure Physical Test to Shells

BANDING PRESSES

For Pressing in Copper Rotating Bands on Shells.

Metalwood Manufacturing Co.

Detroit, Michigan

Designers and Builders of High Speed Hydraulic and Special Machinery for all Purposes

Complete Hydraulic Installations

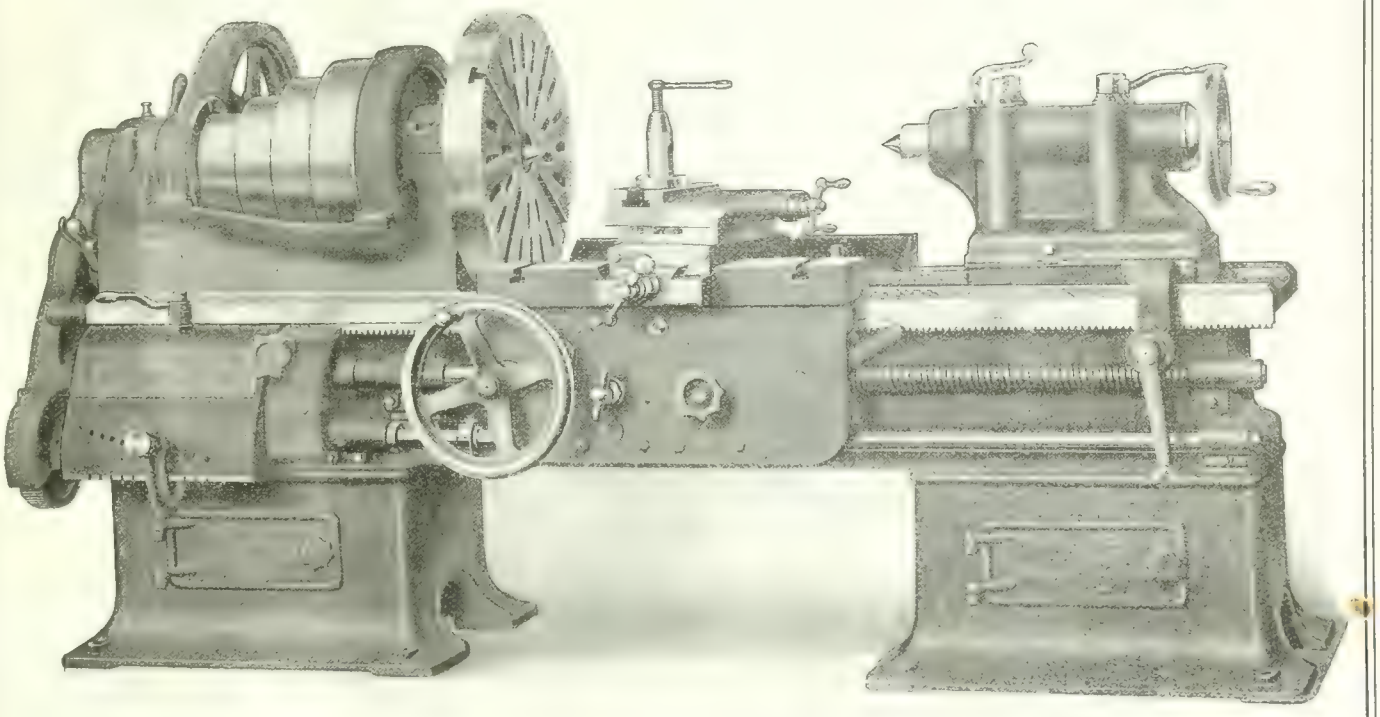
Canadian Fairbanks-Morse Co., Ltd., Sales Representatives for Canada

R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago, Ill., Sales Representatives. For Great Britain and Continent, address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

REED-PRENTICE COMPANY

R-P ©

WORCESTER MASS. U.S.A.



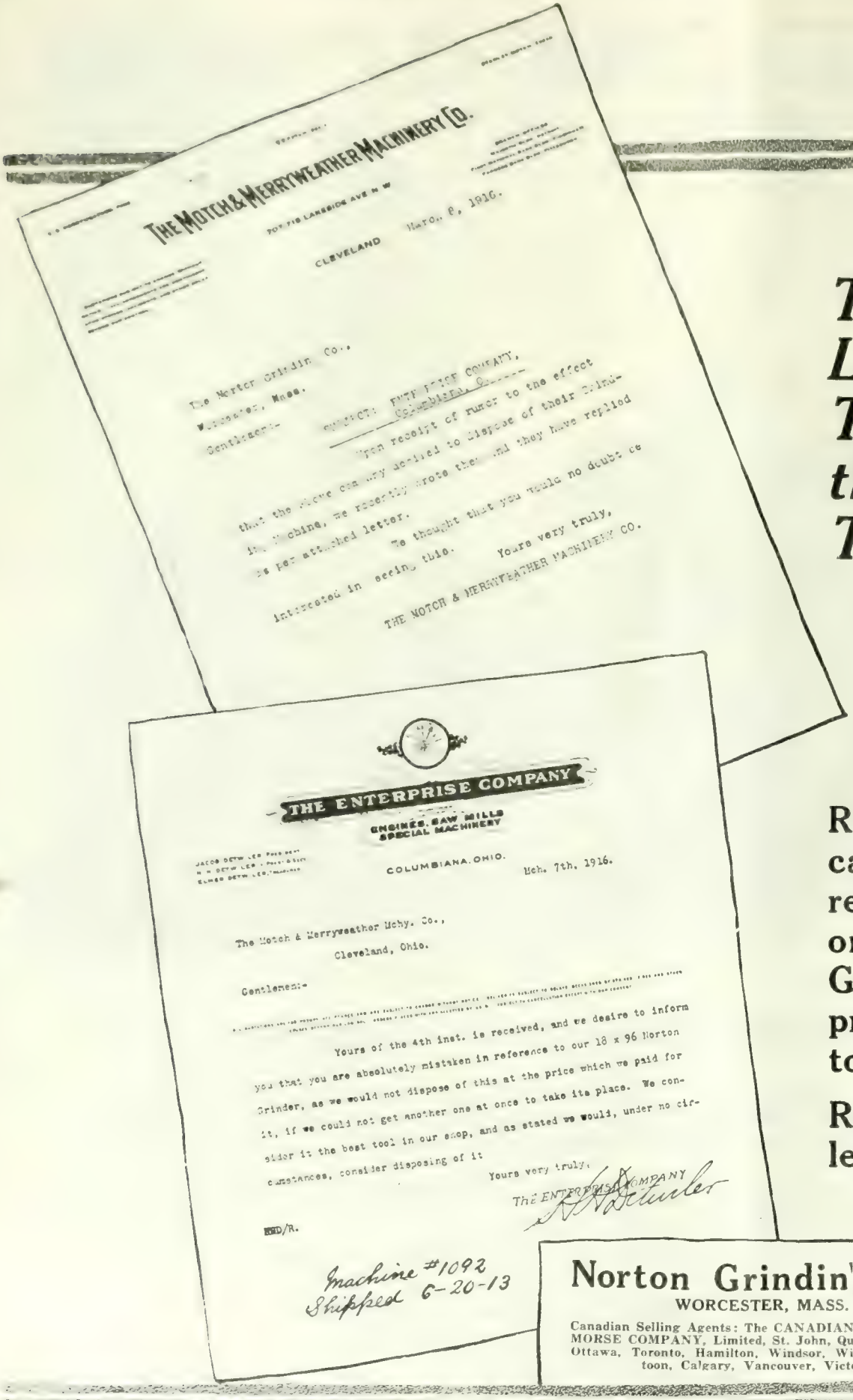
BETTER WORK—MORE CONVENIENTLY

THROUGHOUT THE YEARS THAT "REED" LATHES HAVE BEEN BUILT, THE IDEA OF ITS SPONSORS HAS BEEN TO MAKE IT ONE OF THE BEST TOOLS MONEY COULD BUY.

ITS REPUTATION BEARS TESTIMONY OF THE ATTAINMENT OF THIS IDEAL.

A FEW OF VARIOUS SIZES CAN BE HAD AT ONCE.

CANADIAN FAIRBANKS-MORSE CO., LIMITED
MANNING, MAXWELL & MOORE, INC.
ALLIED MACHINERY CO. OF AMERICA
FENWICK FRERES



THE MOTCH & MERRYWEATHER MACHINERY CO.

CLEVELAND March 6, 1916.

The Norton Grinding Co.,
Worcester, Mass.
Gentlemen-

SUBJECT: FIFTY FOOT COMPANY,
Columbiana, O.

Upon receipt of rumor to the effect that the above company desired to dispose of their grinding machine, we recently wrote them and they have replied as per attached letter.

We thought that you would no doubt be interested in seeing this.

Yours very truly,

THE MOTCH & MERRYWEATHER MACHINERY CO.

THE ENTERPRISE COMPANY

ENGINES, SAW MILLS
SPECIAL MACHINERY

COLUMBIANA, OHIO.

Mch. 7th, 1916.

The Motch & Merryweather Mchy. Co.,
Cleveland, Ohio.

Gentlemen-

Yours of the 4th inst. is received, and we desire to inform you that you are absolutely mistaken in reference to our 18 x 96 Norton Grinder, as we would not dispose of this at the price which we paid for it, if we could not get another one at once to take its place. We consider it the best tool in our shop, and as stated we would, under no circumstances, consider disposing of it

Yours very truly,
THE ENTERPRISE COMPANY
R. D. Detwiler

RDD/R.

Machine #1092
Shipped 6-20-13

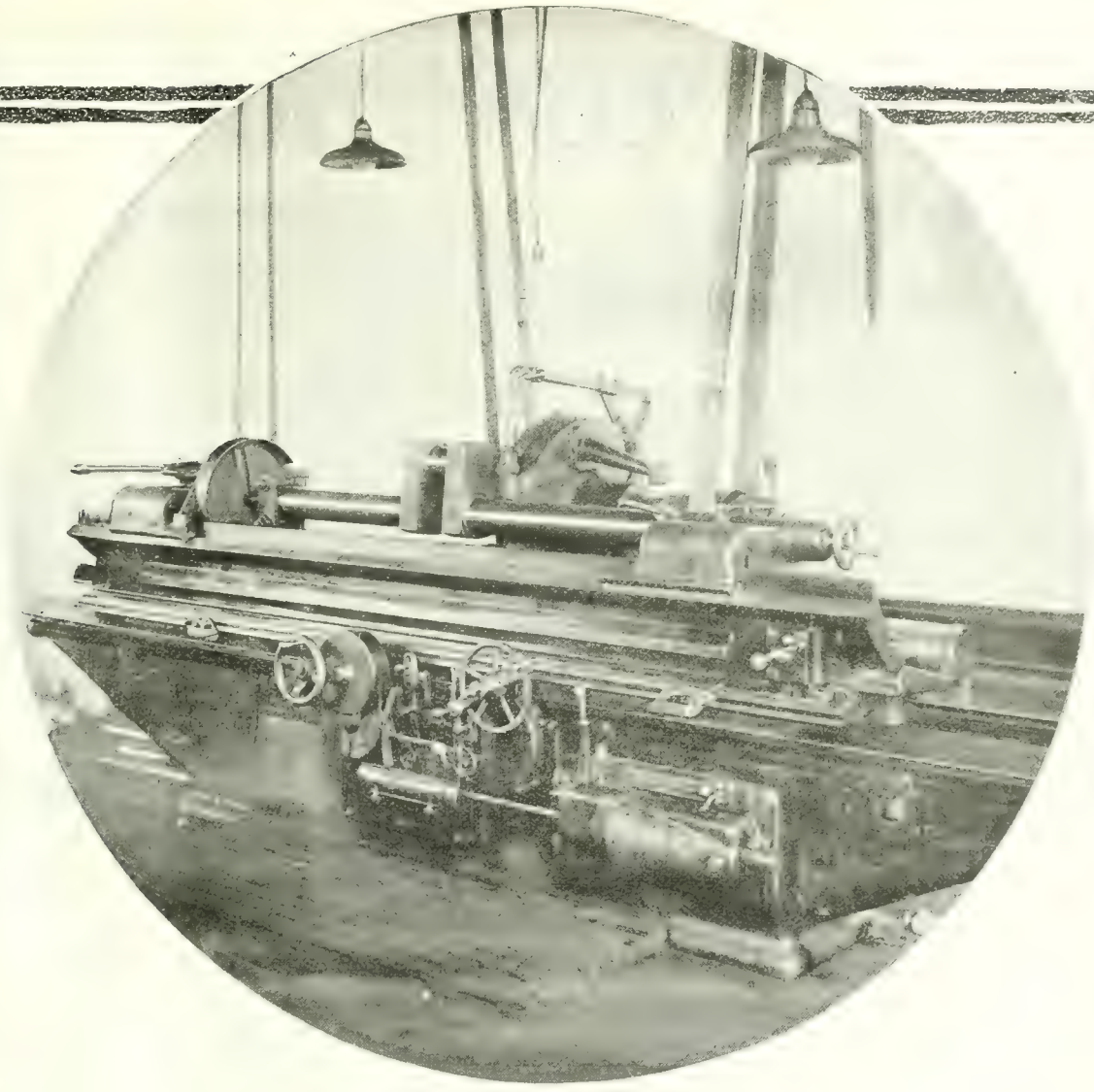
These Letters Tell the Truth!

Rumor casting a reflection on a Norton Grinder proven to be false.

Read these letters.

Norton Grinding Co.
WORCESTER, MASS.

Canadian Selling Agents: The CANADIAN FAIRBANKS-MORSE COMPANY, Limited, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.



No sir, this Norton was not for sale-

We heard that The Enterprise Company of Columbia, Ohio, wished to dispose of an 18 x 96 Norton Grinding Machine which they had installed some years before. The abnormal demand for Nortons, new or used, led us to communicate with the Messrs. Motch & Merryweather, our Cleveland selling agents, asking that they investigate this rumor and if possible buy the machine at once and hold pending our orders.

Read the two letters on the opposite page—from the lower one it would seem, the rumor that The Enterprise Co. wished to sell was not well founded.

But the point we wish to bring out from their letter is the opinion they have of the Norton Grinder—"the best tool in our shop." Certainly you could ask for no broader endorsement of a machine tool.

NORTON GRINDING COMPANY Worcester, Mass.

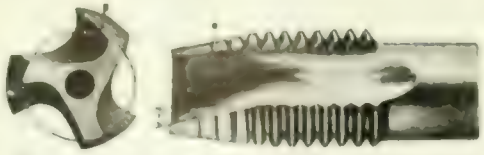
CANADIAN SELLING AGENTS:

The Canadian Fairbanks-Morse Company, Limited

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

If interested, tear out this page and keep with letters to be answered.

The "GUN" TAP



WHY IT IS CALLED "THE SHEAR CUTTING TAP."

The cutting edges of the teeth are ground at an angle to the axis (see illustration, F). This enables the Tap to cut with a shearing action and the angle deflects the chips, so that they curl out and ahead of the Tap and do not break up and collect in the flutes.

EASE OF CUTTING.

Note the hook on the cutting edge (G). This, combined with the shear-cutting action, makes the "Gun" Tap the easiest cutting Tap on the market.

On especially tough jobs—through layers of material of varying hardness it cuts hole after hole with perfect ease.

STRENGTH.

The flutes of the "Gun" Tap are less in number and shallower than those of the ordinary Tap—therefore, in itself is almost as strong as solid stock. Couple with this its easy-cutting qualities and you have a Tap that practically never breaks.

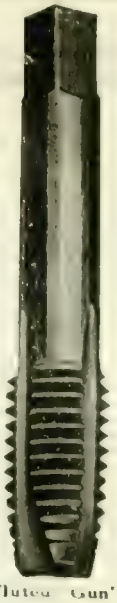
"It Shears"

PRODUCTION.

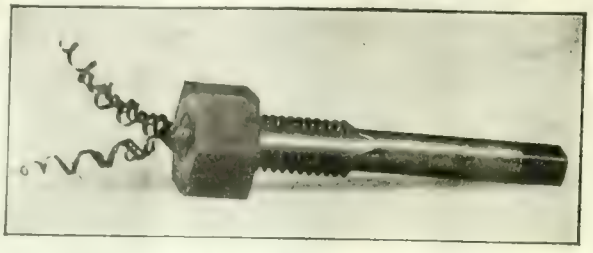
In number of holes tapped in a given time the "Gun" Tap excels, not only because of the easy-cutting qualities and strength already described, but because there is no lost time due to removing broken Taps or frequently backing out the Tap from deep holes to clean collected chips from the flutes.

There will be a tremendous saving in your tapping costs if you let the "Gun" Tap do your work.

Send to-day for the illustrated bulletin which goes into details regarding this remarkable Tap.



Three Fluted "Gun" Tap



Exactly the way chips are produced

WELLS BROS. CO. of Canada, Limited
GALT, ONTARIO

Sales Agents:
THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED,
Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary.

AS A CHAIN

is only as strong as its weakest link, so a file can only be as good as the steel from which it is made.

The steel from which all P.H. Files are made is BEST CLAY CRUCIBLE CAST STEEL only. That is one point of superiority which

P H

TRADE MARK

QUALITY FILES

have over all other files made in Canada.

We will tell you others later.

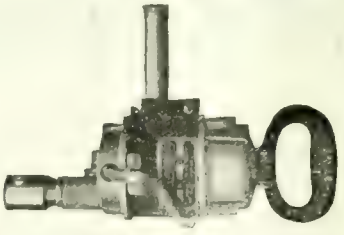
PORT HOPE FILE MFG. CO., LIMITED

Port Hope, Ontario

"Ask your jobber" (23.)

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

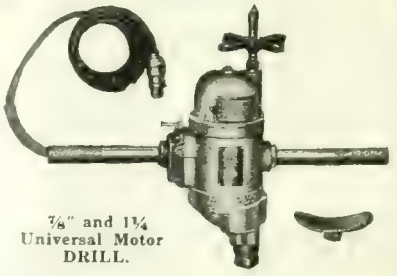
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

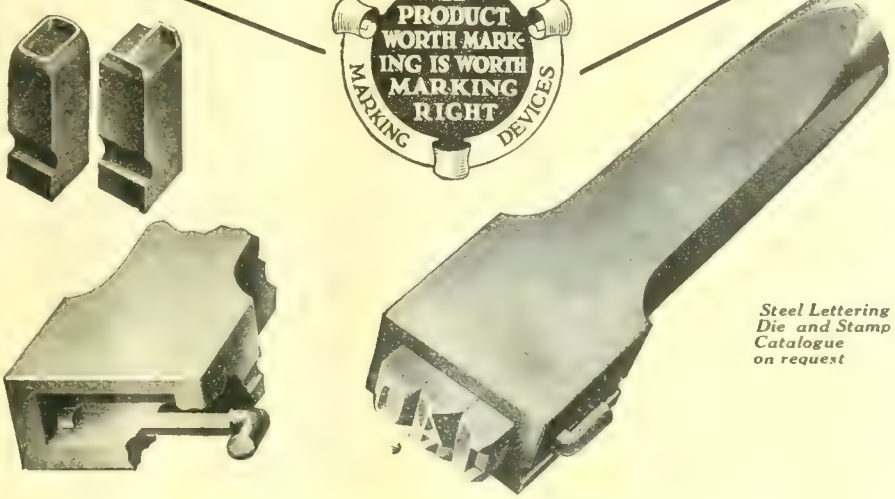
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

If You Change Markings Often, Use CHAMPION HOLDERS

(Patented)



Steel Lettering Die and Stamp Catalogue on request

MATTHEWS' Improved Champion Steel Holders and Interchangeable Grooved Type were developed to simplify, and to economize the cost of interchangeable marking. Holders are made with spring attachment, which, combined with grooved type, keeps letters or figures securely in place, and insures accurate, straight line marking.

Three styles of holders, and three types of letters and figures.

Matthews' marking devices are the best that skill, 67 years' experience and modern equipment can produce. Matthews' deliveries are prompt and Matthews' prices are right. Any device you may require from a small rubber stamp to a steel stamp for marking shells. Send Matthews a trial order.

Jas. H. Matthews & Company, Forbes Field, Pittsburgh, Pa., U.S.A.
67 YEARS IN BUSINESS

Distributors for Canada: Canadian Fairbanks-Morse Company, Ltd.
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McDougall Shapers

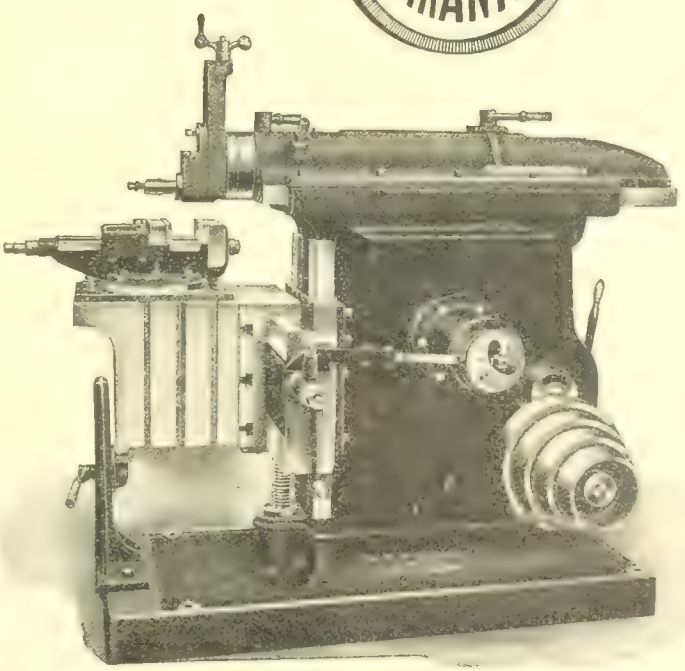
ARE-MAC-DEE IS A GUARANTEE

These are up-to-date Shapers, designed for modern shop production.

They are plain in design, yet embody all essential features necessary for efficient work.

Every adjustment is convenient for the operator and fine for the most accurate work.

Let us have your inquiry.



The R. McDougall Company Limited

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GALT, ONTARIO, CANADA

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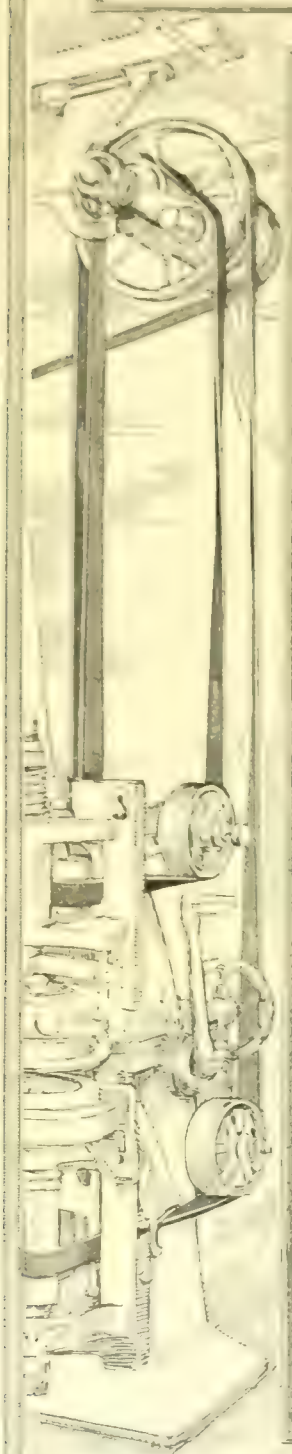
THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

GRATON & KNIGHT

Standardized Series

LEATHER BELTING

Tanned by us for belting use



A Belting Catechism

What are the Advantages of Leather as belting?

Leather is the standard belting material. When properly tanned for belting its surface will grip the pulley in the most effective manner. Good leather belting is economical and reliable. It will transmit power with 98% efficiency.

How can leather belting be made uniform?

The manufacturer must first set up definite standards of quality—and strictly adhere to them. As he cannot secure belting leather in the open market of uniform quality, he must tan his own hides. He must tan them in sufficient quantity to enable him to select for each belt, pieces up to his standard. These pieces must be uniform in weight, stretch, texture, and quality.

Why should belts be rigidly graded?

A belt is no stronger than its poorest part. The quality of leather varies, and unless each belt is carefully graded, dissimilar qualities get into the same belt. Rigid grading *is* uniformity. Grading should be done by expert judges of belt leather quality, according to fixed standards.

Why is there such confusion in leather belting grades?

Because many belt makers have not standardized their belts, but give the buyer any kind of belt he demands. The result is chaotic.

What is Standardized Leather Belting?

Simply belting that is standardized to meet the needs of the different classes of power transmission—instead of being made to meet theoretical specifications. Transmission requirements can be classified into a comparatively few groups, and there is a standardized belt to fit each one. Standardization *can* be applied to belting just as to any other type of machine part or product. It is common sense in belting.

How does Standardized Leather Belting help the belt buyer?

It insures the selection of the proper belt required to speed up machines, to maintain production, to reduce operating expenses, which cannot be accomplished unless the belt user gets the maximum power through his belts. Standardized leather belting effects this for him and enables him to *know* that he is getting the right brand for highest efficiency and greatest economy—maximum service from every belt and every drive.

How does it work?

Let a Graton & Knight representative make an analysis of your belting requirements. Then get the standardized belt for your work, ordering your belting by work to be done rather than by specification. There is no obligation—there may be a great saving for you.

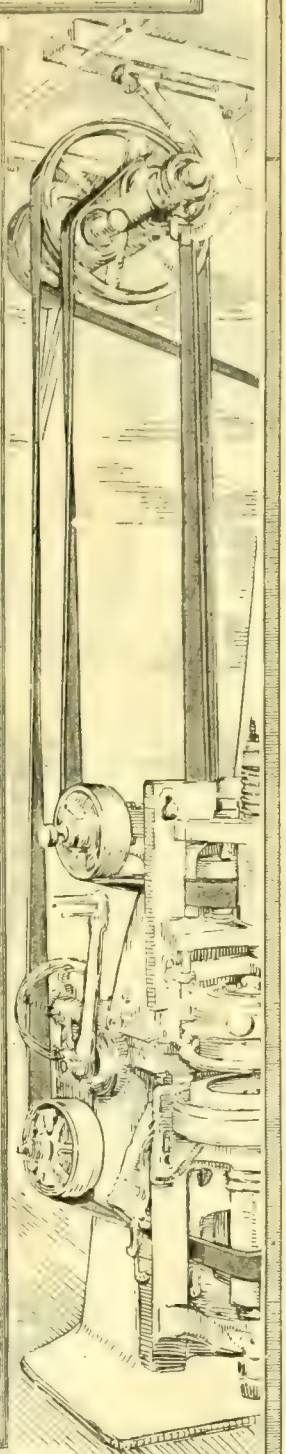
The Graton & Knight Mfg. Company

Oak Leather Tanners, Makers of Leather Belting, Lace Leather, Leather Packings and Sundries

WORCESTER, MASS., U.S.A.

Canadian Representatives: The Canadian Fairbanks-Morse Co., Limited, St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Edmonton, Vancouver, Windsor, Winnipeg, Victoria.

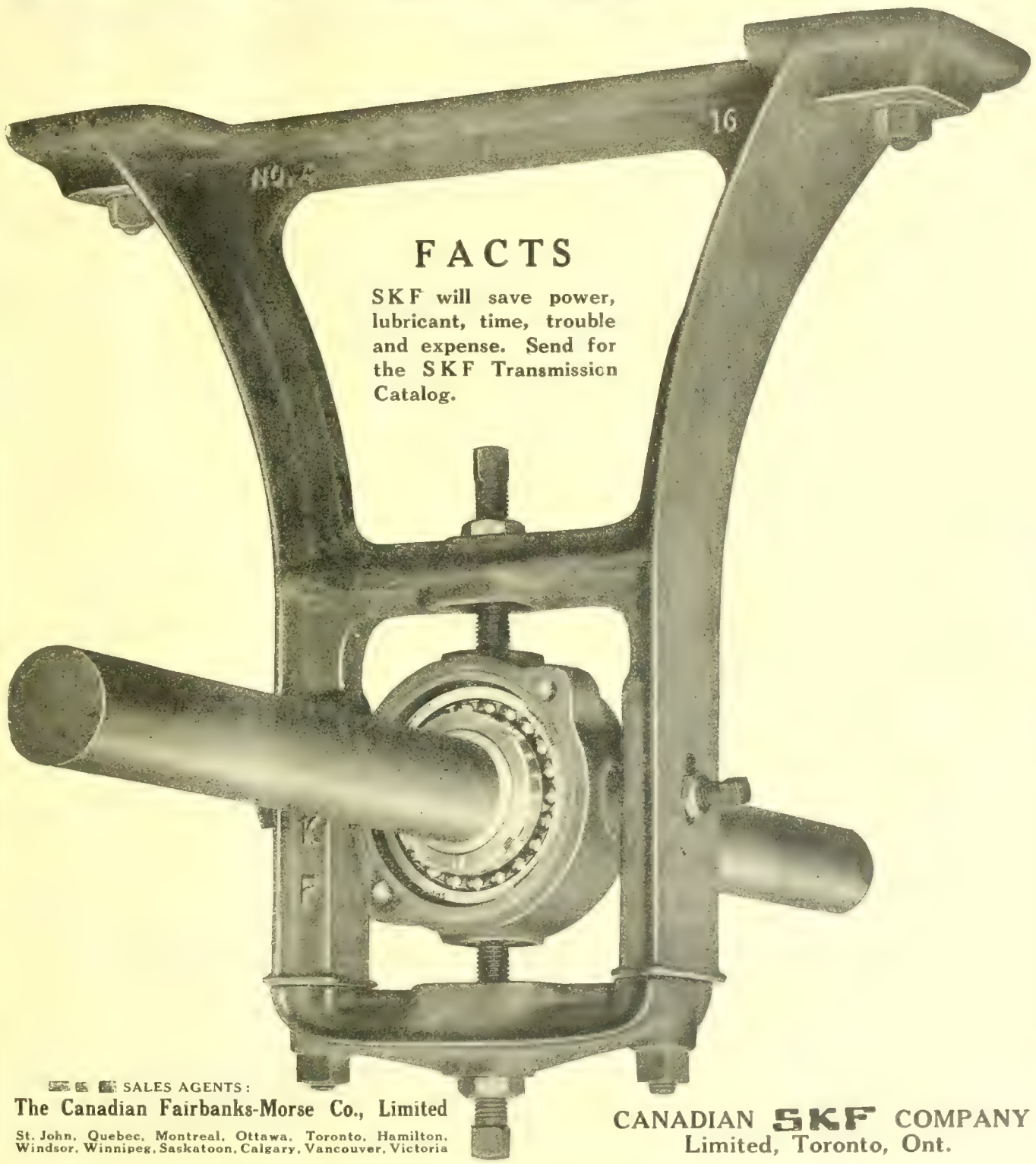
GRATON AND KNIGHT



American Leather Belting on dry [illegible] Ball Co., Ann Arbor, Mich.

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

SKF



FACTS

SKF will save power, lubricant, time, trouble and expense. Send for the SKF Transmission Catalog.

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THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED.

Fairbanks-Morse
Machine Shop Supplies

Cleveland Drills mean Holes.

Norton Wheels mean Grinding Service.

Yale Hoists mean Pound Feet.

Such considerations determined the selection of the lines we handle.

Cleveland Drills and Reamers; Mac-It Set Screws; Wells' Taps and Dies; Wells' Gauges; Brown & Sharpe Milling Cutters, Machine Tools, Micrometers; Yale & Towne Chain Blocks, Travelling Cranes and Trolleys; D. & W. Magnetic Chucks; Union Lathe Chucks; Williams' Tool Holders; Reed Vises; Buffalo Forges; Buffalo Blowers; Matthews' Dies; Universal Hack Saws; Keystone Ratchets, Drills and Reamers.

Send for your copy of the F.M. Book, our new 1,000 page general catalogue.

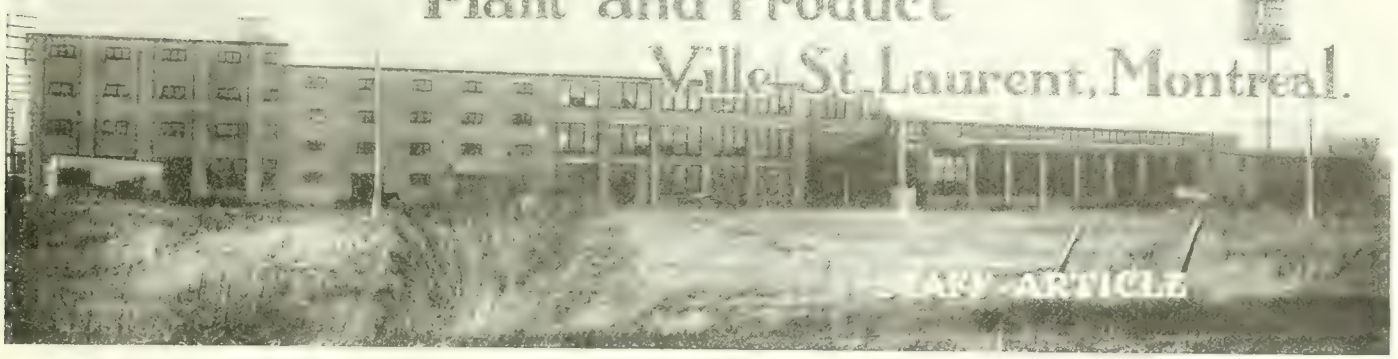
THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

St. John Quebec Montreal Ottawa Toronto Hamilton Windsor
Winnipeg Saskatoon Calgary Vancouver Victoria

Canada Stove & Foundry Co'y.

Plant and Product



Times like the present have produced many contrasts, and few indeed are the factories whose products are not contributory to the arts of both peace and war. That the greater portion of this plant's activity should be devoted to developing the manufacture of peace-time products is a pleasing feature at this time, having in view the economic necessity of maintaining staple lines of industry in active readiness for the return of peace.

RAPID development of plants has been a notable feature of manufacturing activities throughout the Dominion during the past three years, but with few exceptions such expansion has resulted from the urgency of war requirements—directly or indirectly—rather than a marked extension in staple manufacturing. Domestic enterprise, even on a normal basis, has suffered extensively through the high cost of raw materials and the difficulty of obtaining such, except under restricted conditions. One of the few exceptions to these conditions is the plant of the Canada Stove and Foundry Company, Ltd., Ville St. Laurent, near Montreal. This company was incorporated in May, 1916, as successors to the Canada Stove and Furniture Company, the latter having been organized in 1905. Steady progress was made by that company until 1913, by which time the output had attained comparatively large dimensions, and the factory occupied a floor space of 50,000 sq. ft. The rapid growth of the business, however, during the next three years necessitated the building of extensive additions, and in the summer of 1916 the two storey mounting room, the warehouse and foundry were extended; later in the same year a four-storey building was erected for the manufacture of shells, and a storage warehouse.

An entirely new departure was decided on at this time, viz., that of enamelling sheet steel goods and cast iron hollow ware, and a suitable building was erected for this purpose on the property facing the main offices; these latter also being remodeled during the same period. The present floor space available for manufacturing purposes is about 200,000 sq. ft., and together with the adjoining property covers an area of 10 acres. The plant is ideally situated, being located about 7 miles from the city of Montreal, and adjacent to the main line of the G.T.R., with spur connections to both the C.P.R. and the C.N.R.

Foundry

The foundry has a length of 300 ft. and a width of 150 ft. and with the exception of a small section used for heavy pit work, the floor is constructed of concrete, this being considered an efficiency feature where light work predominates. The greater volume of work is connected with the manufacture of stoves and ranges, but considerable jobbing is also done; facilities having been installed to handle individual castings of about 3 tons in weight. A 66 in. Whiting cupola, with a capacity of over 30 tons per day, is located in a wing about midway of the shop length; a Piqua pressure blower being installed to supply the necessary blast. For small plate-moulding work, 50 lb. ladles are provided, and for the larger work several ladles ranging from 200 lbs. to about 4,000 lbs. are employed, these latter being transported about the shop by a monorail system. Pouring is continuous for about three hours each day.

VIEW IN ONE OF THE FOUR BAYS OF THE FOUNDRY

The bulk of the light work is performed in moulding machines; the equipment consisting of 2 Pridmore rockover machines, 3 Arcades, 2 Webb and 3 Davenport power air squeezers, and 2 Adam's hand squeezers. For the baking of cores there has been installed one large Whiting and four small Millett core ovens. The foundry is well lighted, and heated by a forced hot air system with overhead piping, installed by the Canadian Sirocco Co. The remainder

of the factory is heated by means of steam coils.

Mill Department

For the cleaning of the castings in the six steel mills are provided, these being from the open side of a 75 gallon tank 30 in. long. In the front side of the mill of the first five mills will be provided with six tumblers, each of the maximum capacity of castings possible in the mill. For the heavier castings are those that are to be given in the finishing mills, a sand blasting equipment has been provided. Adjoining the mill room is the core-room, which is equipped with the castings are taken from the cleaning room and stored in racks, so that the cores are at all times easily accessible.

Efficient Stock Record System

On the first floor of the main building is the tool room, the cutting room, the former so arranged and equipped that it is possible to determine at any time, by reference to the stock sheets, the amount of material that is on hand and the exact number of stoves that could be made from the available supply. This system extends throughout the entire plant, so that when an order is placed for a large number of stoves a few minutes checking of the different stock sheets advises the superintendent or his chief clerk just what is required to fill the order. Steps are immediately taken on the receipt of an order to arrange the production of the foundry and the purchase of the necessary stock and other accessory supplies, so that no department is handicapped through delay in receiving materials.

The more important machines in the cutting department are a Brown Boggs 8 ft. power squaring shear; a 42-in. double crank consolidated power press for body making and heavy formed work; one Michigan and one Excelsior power press; an automatic top grinding machine made by the Excelsior Tool Co.; a special vertical inside grinding machine for work on stove parts; and a number of smaller tools such as foot shears, harnd folders, and presses, together with all the other necessary shop equipment for the rapid and economic production of sheet metal operations. One section of the second floor is set apart for the nickeling of the numerous ornamental parts now found on nearly every make of cast iron or steel range or heater.

MACHINING DEPARTMENT FOR SMALL STOVE PARTS

Nickeling and Polishing

The nickeling equipment is of the most modern type, a prominent feature being a Hanson and Van Winkle dynamo of 1,000 ampere capacity; all wiring is contained in conduits throughout. The polishing room, adjoining the nickeling department, contains 10 Hanson and Van Winkle polishing machines, driven from a shaft located below the floor; each machine is fitted with an exhaust head, and a Sheldon fan is employed to remove the dust from these machines. The blacking of the different cast iron stove parts is also performed on this floor, as is the wrapping and crating before going to the shipping department.

Gas Stove Mounting

The entire third floor is reserved for the gas stove department; one section is provided with the necessary pipe threading machines, presses and drills required for the different parts and the main portion of the room is used for the mounting of the various makes of stoves. An interesting feature in connection with this department is the drilling of the small holes in the various gas burners by means of multiple drill heads, as many as 72 holes being drilled in one type of burner at a single setting. The presses and multiple drill heads were supplied by the Michigan Press Co. of Ypsilanti.

All finished material for all makes of gas stoves is kept on this floor, the operation of this department being governed by the checking system already referred to. Four concentration points on this floor govern the supply and distribution of all material—the sheet metal stock room, the rough castings department, the general stores department, and the finished material stores. Daily records are kept of stock and orders so as to avoid the possibility of misunderstanding between the heads of the different departments.

The average output of stoves, ranges and heaters is about 100 per day, while the number of gas stoves turned out each day ranges from 50 to 75. The japanning room is equipped with an oil burning oven, maintained at a heat of about 350 deg. F. The interior of many of the gas stove ovens are given a coat of aluminum, sprayed on.

Like most of the large metal working establishments in Canada, this plant has been engaged in the manufacture of shells, having been working on the 4.5 in. size for upwards of two years. The out put to date has been upwards of 250,000 shells.

VIEW IN ONE OF THE MACHINE MOULDING SECTIONS.

VIEW OF PART OF THE GAS STOVE MOUNTING DEPARTMENT

Enamelling Department

The art of enamelling, or the fusion of quartz and chemical compounds to form a hard vitreous surface on metallic objects, either for the purpose of decoration or utility, is gradually assuming increased importance in the industrial developments of the country. Additional enterprise in this direction is the most recent departure of this firm.

The enamelling plant, located directly opposite the main offices, is of brick construction, 120 ft. by 60 ft., and is of single floor construction, with the exception of the front section of two floors, the upper one being used for chemical storage and decalcomania work. The ground floor is divided into three sections—one containing the smelting furnace and the grinding mills, a pickling department, containing acid baths for cleaning the sheet steel articles, and also a steam heated drying kiln, while the greater portion of the ground floor is reserved for the actual operations of enamelling the work.

Three oil-fired furnaces are installed, two being adapted for sheet work, while the third and largest is constructed to handle cast iron hollow ware. Of the two former, one is open hearth and the other muffled type. The fuel is kept in a 800-gal. tank adjacent to the building, and is supplied from the main 10,000-gal. reservoir provided for the operations of the furnaces in the shell machining department. Oil is delivered to the burners by means of a small centrifugal pump, and air for blast and combustion is supplied at a pressure of about 70 lbs. per sq. in. The other equipment of the shop consists of the various receptacles for holding the solutions and the necessary facilities for handling and transporting the work to and from the kilns and furnaces.

Preparing the Frit

The art of enamelling, like other processes of a similar nature, involves considerable knowledge of what are known as trade secrets, many of which are only attainable by actual experience and continual practice. The general features of the work, however, will be gathered from the following description:

The necessary compounds, such as the sedimentary rock and chemicals, are received in the form of shale or powder, and are first mixed and smelted in an oil-fired furnace, the proper proportions of the compound being determined by the particular formula in use. The furnace is divided into two sections—one reserved for colored and the other for white mixtures. The furnace is heated to about 1,600 deg. F., care being taken to avoid over-heating. When the heated mass of materials begins to bubble, the furnace is immediately tapped and the charge run out into a bath of cold water; instantaneous cooling is a very important factor, and to achieve this the frit, as the product is termed at this point, is allowed to flow out in a very fine stream and a current of cold water is played upon the molten substance as it falls into the bath, which is also kept cold by a continual overflow from the wooden tank beneath the pouring spouts. The sudden vitrifaction of the frit facilitates the operation of grinding to the desired degree of fineness, the calcined substance having a glassy appearance and being easily broken into smaller particles.

Grinding the Mixture

After the material is removed from the cooling bath, it is allowed to dry before being placed in the mills for grinding. In addition to the chemicals that are united in the fusing process, others are added preparatory to grinding. Two tumbling mills, 3 ft. dia. by 4 ft. long, and one about 2 ft. by 40 in. long, are provided for this purpose, the two larger being for wet mixtures and the smaller for dry mixtures. The mills are made with sheet steel bodies and cast iron ends, and are lined with a substantial layer of porcelain. The door is similarly lined, and when placed in position the inner wall coincides with the remainder of the cylinder, thus forming an undisturbed surface for the movement of the revolving mixture.

One of the very important requirements in connection with the preparation of the chemicals and various ingredients used in the art of enamelling is that every facility be adopted and the greatest care exercised to exclude the presence of foreign matter which would have a detrimental effect upon the ultimate results. The friction and impact required to grind any substance to powder entail the use of grinding mediums which must be much harder than the material being ground. Flint stones are generally used for the grinding of enamelling powders, as the wear upon them from the continual tumbling is imperceptible, and thus assures the powdered material being practically free from any substance other than those placed in the mill. Extreme care and cleanliness must be exercised in the preparation of the materials and their subsequent use in the enamelling process; and to eliminate trouble at a future stage of the work special attention is given to all these elementary factors.

After the charge in a mill has been ground to the desired grade of fineness, generally requiring from 5 to 6 hours, every particle of the powder, together

VIEW OF NICKEL PLATING DEPARTMENT SHOWING VATS AND DYNAMO

TWO OF THE FURNACES IN THE ENAMELLING DEPARTMENT

Enamelling Sheet Stock

somewhat varied for sheet work and castings, due to the difference in the chemical content. For castings or sheet work the powder is prepared in the form of a wet coating, into which the parts are dipped; while the process for castings requires the application of the enamel in a powdered state distributed evenly upon the surface of the work. The primary essential in the enamelling of sheet metal is the selection and preparation of the material.

After the sheet iron has been cut and formed into the shape desired, the pieces are thoroughly cleansed in an acid bath and then well washed in hot and cold water, being afterwards immersed in a special solution and again washed in water to destroy further action of the acids. All trace of moisture is entirely removed by placing the treated work in a drying kiln, after which it is ready to receive the ground coat. In the general run of sheet steel work that is subjected to the enamelling process, particularly the class of work that is handled in this plant, the entire surface of the work is treated with a ground coat, this invariably being of a dark blue color. The enamel is in the form of a creamy solution contained in galvanized sheet steel tanks, into which the work is dipped and swung with a peculiar movement so as to insure an evenly distributed coating over the complete surface of the work. This is a very important detail, and the girls employed become very expert in the manipulation of the different shapes and sizes they are called upon to handle.

Drying and Burning

After being arranged in rack trucks the pieces being kept separate—they are moved into the drying kiln to remove all traces of moisture; when thoroughly dry, the work is ready for baking. Special facilities are provided at the front of the furnace for handling the work. The pieces are placed on bars provided with sharp prongs, so that only the points are in contact with the material; this method avoids serious marking of the under surface and also prevents distortion of the work. Several pieces are placed on this rack and the whole run into the furnace, which is kept at a temperature of between 1,500 and 1,600 deg. F.

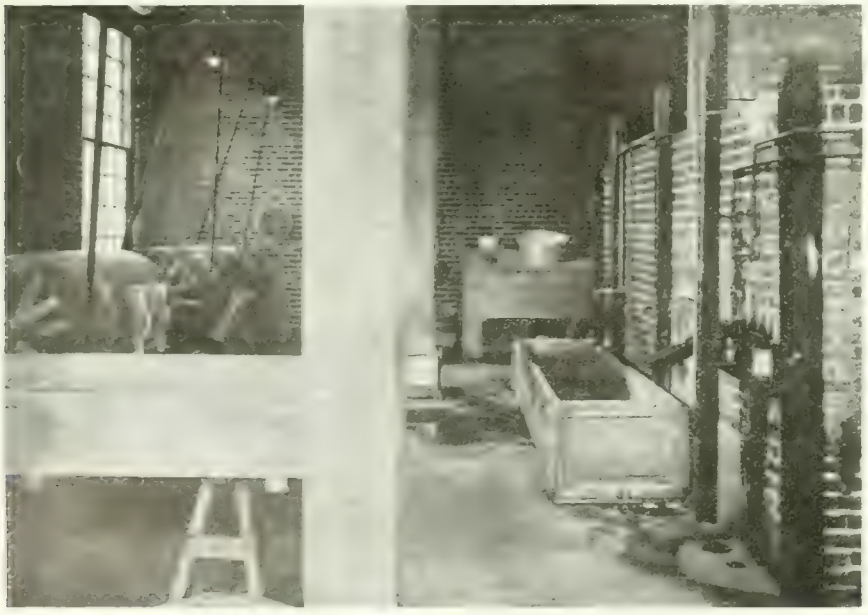
Baking or burning, which constitutes the fusing of the enamel coating, occupies about one or two minutes, and when the work is taken out it is immediately removed and placed on a flat plate to retain the shape while cooling. When cold, the same sequence of operations is again followed for the succeeding coats. The general practice in this plant is to give the work one ground, one intermediate and one finishing coat; this gives a fairly flexible surface; a thicker enamel is liable to develop cracks.

For embossed work, such as lettering or ornamental designs, the plant is equipped with a spraying outfit, this being the only method that will insure equal distribution of the enamel solution. When work of this character is dipped the solution gathers about the raised impressions and destroys their prominence owing to the inability of the solution to drain freely from the irregular portions.

Process for Cast Iron

The method of enamelling cast iron differs to some extent from that used in coating sheet material. The application of the ground coat is accomplished in a similar manner, the piece being swabbed with a thin solution and then dried, after which the article is placed in the furnace and heated to a cherry red, when the work is removed from the fire chamber and sprinkled evenly over the entire surfact with finely powdered enamel and again placed in the furnace, allowing the powder to fuse and spread evenly over the surface; this process is continued until the desired coating is obtained. The surface of the iron must be perfectly clean and free from corrosion, as the chemical action of the rust will not allow the enamel to set properly, a blemish appearing wherever rusting has occurred.

In the preparation of the various formulæ the company have given special attention to those for cast iron hollow ware subjected to chemical reaction during the boiling or cooking of fruits and



MIXING AND GRINDING MILLS. NOTE TANK INTO WHICH MOLTEN FRIT IS RUN.

vegetables that contain a large percentage of acid. Enamel work of this character must withstand the severest acid test before it is permitted to leave the factory.

Ornamental Work

Floral and other ornamental designs for the decoration of signs, stove panels, etc., are included in the work of the enamelling department. Meyercord's process of enamel decalcomania is the method used in putting on the various designs; after being transferred to the previously enamelled surface, the articles are again baked in the furnace and the color design is burnt in and becomes part of the enamel coating.

The range of product manufactured by this firm includes wood burning cook stoves, cast iron and steel stoves and ranges for wood, coal and gas, and in addition specializes in numerous items of cast iron house and factory equipment, much of which is now being treated in the new enamelling department.

Owing to the semi-isolated position of the plant, special provision has been made for fire protection; in addition to a well trained fire-fighting force, the entire factory is equipped with a sprinkler system. Shop welfare and first aid departments are also features of the plant management. The executive consists of E. Panneton, managing director; J. A. St. Germain, secretary-treasurer; F. Lauer, general superintendent; and Chas. Watt, superintendent of the shell department.

WAR SERVICE BOARD FOR U. S. FOUNDRY INDUSTRY

IN order to maintain proper contact between the foundry industry and those departments of the United States Government which purchase castings a war service board of five members has been organized by the American Foundrymen's Association, the members being: R. A. Bull, chairman, Duquesne Steel Foundry Co., Pittsburgh; J. C. Haswell, Dayton Malleable Iron Co., Dayton, O.; G. H. Clamer, Ajax Metal Co., Philadelphia; H. D. Miles, Buffalo Foundry & Machine Co., Buffalo, and C. C. Smith, Union Steel Castings Co., Pittsburgh.

The personnel of this board is representative of every branch of the foundry industry, including gray iron, steel, malleable iron and non-ferrous metals. Furthermore, its members are affiliated with the leading organizations of casting manufacturers of the United States, as follows: American Foundrymen's Association, National Founders' Association, American Institute of Metals, American Malleable Casting Association, and the Steel Founders' Society.

In view of the tremendous task undertaken by this board, numerous sub-committees undoubtedly will be appointed to represent the various lines of each branch of the industry. A survey of the foundry trade of the country undoubtedly will be made to ascertain the class of work for which each shop is best adapted. The establishment of an office in Washington is being considered.

COAL FAMINE THREATENS SWITZERLAND

THE shortage of fuel threatens to develop into famine in some neutral countries, and the danger is being met in two ways, viz., by stringent official restrictions as to the uses of fuel, direct or indirect, and an increased exploitation of existing home supplies. Switzerland has perhaps felt the inconvenience more than most other countries, and the Government of the Canton of Zurich, for one, has just issued fresh restrictions. Private houses must not be heated, unless the temperature for three consecutive days has been below 10 deg. C. and on days when it has been only 5 deg. C. the previous evening. The temperature in residences, schools, offices and workshops is not to exceed 16 deg. C., in shops not above 14 deg. C., and in bedrooms not above 12 deg. C. Hot water appliances must only be used once a week and school baths only once a month. Other public baths may in the meantime be kept open except on Mondays and Tuesdays. In cafes, restaurants, etc., there must be no heating from 10 p.m. to 10 a.m., and no hot food must be served after 9 p.m. All offices are to close at 5 p.m. and museums, libraries, etc., must not be warmed at all. The schools are to save 35 per cent., churches and chapels 50 per cent., cafes and restaurants 35 per cent., shops and public buildings 25 per cent., elsewhere according to circumstances from 20 per cent. to 40 per cent. of the quantities of fuel hitherto used. In four-roomed residences only one room must be heated, in larger residences only two. On the other hand endeavors have quite recently been started to exploit possible deposits of coal, lignite, and even petroleum, but this work is still in its first stages. Borings for coal are taking place in Wallis and Jura, at Herdern, etc.; lignite deposits have been taken in hand at Grondiseril, Ufhusen and Zell; lignite has also been come upon at Fosytal. Some foreign capital is interested in this work, as, for instance, in the International Development Associated Mines Company at Sitten, for the exploitation of the Wallis deposits, where some anthracite, though not of the best quality, has been found.

GOVERNMENT CONTROLS BRITISH GUIANA BAUXITE

THE British Government is now taking a very firm stand with regard to the exploitation of the important bauxite discoveries in British Guiana, and is determined that the first call on this mineral, the source of aluminum, shall be reserved for the Empire. The British Empire Producers' Organization has already pointed out that no further applications for bauxite lands in British Guiana are to be granted till after the war. But it appears that the Government have gone further than this. A portion of the bauxite won by holders licensed before the above regulation came into force has to be placed at the disposal of the British Government at a certain price. The British Government, moreover, reserves the right to limit the export to countries other than British, and at its discretion to prohibit export altogether. Practice, moreover, has followed principle, and a large export shipment to a foreign country of British Guiana bauxite won by a company in which foreign interests are partly represented was recently, it is stated, held up. Such evidence of a determination to conserve in future the mineral wealth of the Empire for the Empire is highly encouraging.

TUNGSTEN PRODUCTION IN ENGLAND

THE manufacture of pure tungsten from its ores has now become an established industry of Great Britain, as since the inception of the war its production has been attempted by local firms and is being achieved on a scale which should render the country independent of the German product for all time and materially aid the tool steel and allied industries in retaining the markets of the world for high-speed steel.

In describing a plant and the processes involved, a recent number of *Engineering* says: When the war broke out the site of the works was waste ground, with the exception of a small building and a chimney; since the summer of 1914 a large group of buildings, has been erected on a six-acre site. These are filled with complicated mechanical appliances, the work-people have been trained to new and varied duties, and an uninterrupted output has been maintained. Extensive railway sidings are laid, but at present motor lorries are employed for the despatch of the finished product to the works of consumers, whose urgent need of tungsten makes the inevitable delay of railway transport serious. The company, it may be said, has not overlooked the comforts of the workpeople, both men and women, some of the processes being carried out by girls. Messrooms for the convenience of both have been provided. All the buildings are lofty and well ventilated and lighted, and none of the processes, nor any of the work, can be described as in any way unhealthy. A notable point is the absence of dust, although the processes are such as to give rise to large quantities; all plant producing it is enclosed. A repair shop is included among the buildings, consisting of a smithy and engineers' and joiners' shops, and a large block of offices facing the main road accommodates the management.

All the processes are arranged on the ground floor level, but some of them extend upwards as well, and are reached from several floors. Taking the processes in their order, the trucks bringing the ore, soda and other requisites are run alongside a staging in the warehouse, arranged at a convenient height for unloading, the wagons being handled by the

company's locomotive crane. The ore is received broken into small cubes, which would readily pass through a 1½ in. mesh. It consists of tungsten ores and waste material, and it has to pass through eight operations, each carried out in a separate department of the works. Of these eight operations six are necessary to isolate or separate the tungsten oxide from the other constituents of the ore and the remaining two operations to remove the oxygen, so as to obtain the pure metal. Some ores contain tin or bismuth of sufficient value to be recovered, and this is effected by magnetic separators, wolfram being slightly magnetic. The first step is to sample and assay the ore, which then is loaded into small trucks and elevated to a series of bins some 60 ft. above floor level. Parcels of ore requiring different methods of treatment are kept separate. From the bins the ore passes to grinding machines, and thence to calcining furnaces, magnetic separators or fine grinding mills, as its composition may require.

Only wolfram, finely ground and ready for treatment, passes forward to the regular process; and impure or mixed ores, which cannot be improved by mechanical or magnetic methods, go to a special department referred to later. The pure wolfram thus obtained is conveyed in trucks to bins placed over mixing machines, adjacent to a supply of soda. The finely ground ore and the soda, in accurately weighed proportions determined by analysis in the laboratory, are then fed into double-arm mixers, and the mixed product is discharged into trucks for conveyance to the melting furnaces, in which is performed operation two in the works department "B."

Scheelite, that variety of ore consisting of tungsten, calcium and oxygen, also known as calcium tungstate, as well as mixed wolfram-tin slimes, tin residue mixed with small quantities of tungsten ore and residues of other sorts, are treated in a separate plant, so that impure sodium tungstate may be isolated and purified before being passed on to the main process.

The next building contains a series of hand-fired reverberatory furnaces of special design, into which the ground ore and soda are fed and heated to a temperature of about 1,000 deg. C. and subjected to constant rabbling. The furnaces just mentioned are designed to economize floor space; they are fed on one side with ore and are stoked from the opposite side. Flues below the floor connect the furnaces with a centrally-placed chimney, 150 ft. in height and 9 ft. in diameter. Ore mixtures are carefully selected, so far as the restricted supply permits, to yield a uniform furnace product, and the charge is drawn into slag pots, which are wheeled to a convenient point for handling by an overhead electric travelling crane. These pots, when cool, are raised and tipped, the charge coming away in a solid lump, which is easily broken up by hammers to a size suitable for feeding a jaw breaker, in which the lumps are reduced to about 1-in. cubes. The melt produced is a great contrast to the fine powder fed into the furnaces. After having been broken up it has to be finely ground in order that it may be acted upon by the chemicals, these processes forming the third operation, carried out in department "C." The material is handled by an overhead crane, and the main shafting is run under the floor to give the crane a free passage.

In the fourth process, in the "D" department or building, the finely ground melt is placed in a number of steam-heated circular vats, in which the tungstate of soda, which is soluble, due to the soda, is extracted from the ground furnace melt. Mixers are provided in the vats, and the solution of sodium tungstate, carrying in suspension finely divided oxides of iron, manganese, lime and silica, is forced through filter presses. The resulting solution thus clarified contains essentially sodium tungstate, the purity of which depends upon the absence of sulphur, arsenic and other elements, which form soluble compounds with soda. Tin oxide, which occurs in many of the ores, under correct working conditions does not become soluble, and remains in the filter cake. The steam required for the "D" department is obtained from an adjoining boiler-house, containing two Lancashire boilers.

In the "E" department the fifth process is effected in a series of special vats on a raised platform. The tungstate of soda is treated with hydrochloric acid, which is elevated by compressed air, and results in the tungstate of soda being broken up into tungstic acid (WO_3) and sodium chloride, which remains in solution. The solution, with the WO_3 in suspension, is conveyed to another series of vats, in which it is washed by decantation, to rid it of the soda salts. As much water as possible has to be got rid of, and after the final wash the WO_3 is brought to a creamy consistency by the surplus water being syphoned off. This cream is then conveyed to a number of centrifugal machines, in which the WO_3 collects along the inner face as a thick, deep chrome-yellow paste. It is dug out with wooden spades and finally dried in a series of bottom-heated stoves. This drying process is the sixth, and is effected in the "F" department. The chemical processes may now be described as completed, as all that remains to be done is to obtain the pure metal from the oxide, which is an ordinary metallurgical operation, involving only heat and the presence of a suitable reducing agent, such as carbon, hydrocarbons, hydrogen, zinc, aluminum or others.

The seventh process, in the "G" department, is effected in a large roomy building containing a number of specially designed furnaces. The yellow paste is passed into the end of each furnace and raised to a high temperature to effect reduction, and the metal is thus obtained. The output of these furnaces is a black material, which is conveyed into the last, the eighth of the series of buildings, where is is ground to a powder, washed, dried and poured into tin cases about 1 cub. ft. each in size, containing 200 lb., and finally, after soldering, packed in wooden boxes or metal containers, ready for conveyance to the consumers.

FIRE LOSSES DURING OCTOBER

THE losses by fire in the United States and Canada during the month of October, compiled from the records of the New York *Journal of Commerce*, reached a total of $26,384,450, as compared with $17,701,375 in October last year and $14,465,850 for the same month in 1915. The unusually heavy October losses added to the already serious fire record thus far this year brings the total up to $221,002,315 for the first ten months of 1917, as compared with $189,481,220 for the same months in 1916 and $140,754,250 in 1915. The losses of October this year were increased by the large grain storehouse fire in Brooklyn involving $2,000,000 and the railroad dock fire at Baltimore involving $3,500,000, but aside from these there was an unusual number of fires resulting in losses anywhere between $200,000 and $750,000. The following table gives a comparison of the losses by months for the first ten months of this year with those of 1916 and 1915, together with the losses for the balance of those years:

	1915.	1916.	1917.
Jan.	$ 20,060,600	$ 21,423,350	$ 36,431,770
Feb.	13,081,250	24,770,770	29,587,660
March	18,786,400	38,680,250	17,523,000
April	18,180,350	12,681,050	18,597,225
May	11,388,450	15,973,500	24,968,800
June	10,893,950	12,247,500	15,513,270
July	9,006,800	23,013,800	16,143,050
Aug.	10,067,100	10,745,000	21,751,100
Sept.	14,823,500	12,244,625	14,101,450
Oct.	14,465,850	17,701,375	26,384,450
Total ten mos.	$140,754,250	$189,481,220	$221,002,315
Nov.	21,201,850	19,898,450	.....
Dec.	20,877,100	22,063,325	.....
Total for year	$182,836,200	$231,442,995	

Many Big Fires

During October this year there were some 270 fires, each causing an estimated property damage of $10,000 or over. This compares with 193 such fires in September, 211 in July, and 211 in August. The number of fires causing a loss of $10,000 or over since January 1, this year, reaches a total of 2,574. The October fires of $10,000 and over are classified according to their destructiveness and show the following results:

Estimated loss—	Number of fires.
$ 10,000 to $ 20,000	88
20,000 to 30,000	53
30,000 to 50,000	26
50,000 to 75,000	27
75,000 to 100,000	19
100,000 to 200,000	28
200,000 and over	29
Total	270

Fire underwriters are looking forward with some uneasiness to their annual statements for the year 1917, as between the abnormally heavy fire losses and the serious drop in security values many will show depleted surpluses.

The Economical Use of Grinding Wheels in the Foundry*

By W. T. Montague**

Next to a proper understanding of the grinding wheel as a cutting tool, the author points out the necessity of giving careful consideration to the castings to be ground, specially referring to their size and shape, the physical properties of the metal and the amount of grinding to be done. Weight and rigidity of machines, solidity of foundations, and suitability of bearings and lubricating arrangements are points of particular interest.

THE modern grinding wheel plays an extremely important part in the metal-working industries. Its great usefulness begins in the foundry just as soon as the newly-poured castings have become sufficiently cool to be removed to the cleaning floor. It is used in the alloy steel industry to remove seams, blisters and flaws from billets, prior to rolling them into commercial shapes. Large numbers are used later on to grind the various metal parts that are fashioned into machine tools, automobiles, aeroplanes, locomotives, war munitions and the multitude of steel tools that are also employed in cutting metals.

Realizing that the grinding wheel is practically indispensable to the foundryman, it is fair to assume that he is vitally interested in those factors that contribute to the economical use of this cutting tool. Although widespread publicity has been resorted to by some of the grinding wheel manufacturers, in order to demonstrate the methods of using and caring for grinding wheels to obtain maximum service at minimum cost, yet tsere are evidences that there is much to be learned in this direction.

To develop the modern grinding wheel into a tool of usefulness and dependability, has been the abrasive manufacturer's problem, but the problem is not solved when the wheel is produced. The grinding wheel maker must go further than this. He must educate the user so that he can take advantage of all the qualities that science and skill have put into the wheel.

Analysis of the Grinding Wheel Problem

The development of this paper will rest upon the following analysis of factors that will contribute to the economical use of grinding wheels in the foundry, if they are understood and taken into consideration:

1.—A thorough understanding of the grinding wheel as a cutting tool is the first essential.

2.—The castings to be ground must be carefully considered with special reference to their size and shape, the physical properties of the metal, and the amount of grinding to be done.

3.—The condition of the grinding machines must be satisfactory. This refers to weight and rigidity, solid foundations, adequate bearings and proper lubrication.

4.—The speed of the grinding wheel is of the utmost importance and must be held within certain limits if proper cutting action and economy in wheel consumption are to be obtained.

5.—The personal factor must be taken into consideration and allowances made for it.

6.—Adequate records of wheel consumption should be kept and if conditions warrant, industry and economy on the part of the workmen should be properly rewarded.

7.—The use of the grinding wheel should be made safe by proper protection devices.

The first portion of this paper will deal with the proven theories of cutting action. They will be gone into quite fully, as it is believed the information will be available to foundrymen who may be using grinding wheels.

It is a well-known fact that the amount of work one gets out of a machine, engine or tool, is often directly proportional to one's knowledge and understanding of that machine, engine or tool, granting, of course, that the tool is not defective or unsuited to the operation in the first place. This is particularly true of the grinding wheel, which is an aggregation of minute cutting tools bonded together so they can withstand the high rotative speed necessary to rapidly remove large quantities of metal.

The composition of the vitrified grinding wheel, which type is almost always used for snagging castings, is as simple as its manufacture is complex. It is made of abrasive grain, clay bond and water. Subsequent burning in a kiln and heat treatment vitrifies the bond and produces that quality termed "hardness."

The selection of abrasive material is almost entirely dependent upon the nature of the metal to be ground. There have been developed for cutting the metals used in castings to-day, two principal kinds of artificial abrasive—the aluminous group and the carbide of silicon group. Included in the former are alundum, aloxite, boro-carbone, adamite, and the like, and in the latter group crystolon, carborundum, carbolite, etc. Without going into the reasons therefore, we will simply state that experience has shown that for materials of high tensile strength, the aluminous abrasives prove the most efficient. This means that the various kinds of steel, wrought iron and annealed malleable iron, automatically call for an abrasive such as alundum. On the other hand, crystolon is chosen for cast iron, including gray and chilled iron, unannealed malleable iron, brass, bronze, aluminum and copper, which are materials of comparatively low tensile strength. This distinction is clear cut and quite easy to remember.

The Question of Grain Size

The question of what size of grain to use is not difficult to settle. The size of the wheel, amount of material to be removed, and the nature of the metal usually determine this very readily. Finish is seldom a consideration and so very coarse grits are used.

How hard to bond a grinding wheel is a point not so readily determined. The influencing factors are many, including:

1 Physical properties of the metal to be ground.
2—Shape and condition of the surface to be presented to the face of the grinding wheel.
3 Speed of the grinding wheel.
4—Condition of the grinding machine as to rigidity and steadiness of spindle.
5—Method of applying the work, that is, whether mechanically or entirely by hand.

In trying to serve our customers and meet their requirements, we are continually reminded that the question of what constitutes a "grade" or the degree of hardness of a grinding wheel is not fully understood. Grade is the word used to designate relative hardness of any given grinding wheel. By hardness, we do not in this instance refer to the hardness of the abrasive, which is fixed throughout any one wheel. We refer to the strength of the bond in retaining its grip on the cutting grains of the wheel. If the bond is of insufficient strength to hold the cutting particles in the face of the wheel until they have become dulled and worn from the cutting process, then we call the wheel too soft. On the contrary, an excessively "hard" wheel is one where the bond retains the grit long after it has become dulled and is therefore practically useless. The word "hardness" might almost be called a misnomer and perhaps the somewhat more clumsy phrase, "resistance to disintegration," ought to be substituted.

This resistance to disintegration, or grade, is actually determined by measuring another separate property of the wheel, namely, the resistance of the bond to the penetration of a hardened steel tool. However, it is known that each of these properties is a function of the other and to measure the force of resistance to disintegration in grinding wheels has been impossible on a commercial scale up to this time.

*Read before the annual meeting of the American Foundrymen's Association, Boston, September, 1917.

**With the Norton Co., Worcester, Mass.

The belief is quite common that a grade is an exact value. A grade is not an exact or a definite point on the scale of hardness. It is a range between limits and all wheels which test within this range carry the same grade letter.

One way to measure the strength of the bond is to revolve a grinding wheel at increasing speeds until it bursts. Knowing the bursting speed, the centrifugal force necessary to cause the bond to break down can be readily calculated.

In order to obtain this data a lot of wheels were speeded up to a point where the fiber stress, due to centrifugal force, exceeded the strength of the bond and breakage occurred. All of these wheels were of the same size, with the same grit, but of different degrees of hardness. The grade J broke when the stress was 1600 pounds per square inch, the grade K at 1700 pounds per square inch, and so on. Therefore, one might infer that all grade J wheels would burst when this same stress was reached.

Not an Exact Value

Now let us see what really happens when several wheels of supposedly the same grade are tested. We find that those that have been determined to be of grade J hardness will burst at stresses ranging from 1600 to 1790 pounds per square inch, grade M at from 1880 to 1790 pounds per square inch and so on. In other words, a grade represents a range of values between definite limits. An understanding of this point is most essential to the users of grinding wheels and will explain many seeming variations in grinding wheel action and life.

Assume a certain snagging operation is being performed, whereby all the factors combine to bring a pressure against the grain on the face of the wheel which causes a stress of a particular nature to be set up. Bear in mind that this is a tangential or peripheral stress, so to speak, not a stress due to centrifugal force. The wheel whose bond has a strength of sufficient magnitude will have a longer life than one not so constituted. This last wheel will not be bonded strong enough to withstand the grinding forces and will wear away quite rapidly, in fact, much more rapidly than the difference in strength or hardness would seem to warrant. This point has been developed in detail because an understanding of it will eliminate many questions arising between the wheel manufacturer and the wheel consumer. It is needless to say that there is a close limit to the allowable variation and the manufacturer who best keeps within these limits, deserves the greatest confidence of the consumer.

The old idea of grinding considered it as a wearing down of the metal by rubbing or friction. This is now our understanding of the lapping process and modern grinding has progressed far beyond this point. However, if a wheel is bonded too hard for the work at hand, or if the wheel is too fine or composed of an inferior abrasive, the metal is actually rubbed or burned off, as shown in Fig. 1.

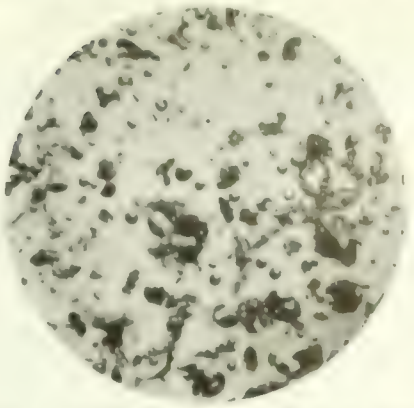


FIG. 1. CHIPS FROM WORK GROUND WITH AN UNSUITABLE WHEEL UNDER IMPROPER CONDITIONS

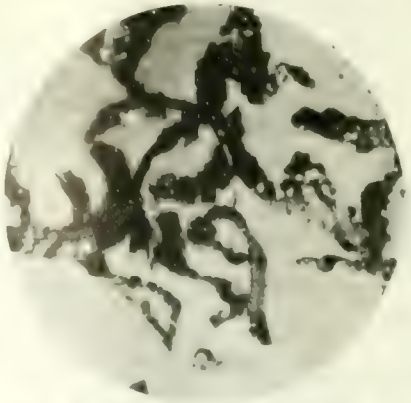


FIG. 2. A MODERN GRINDING WHEEL OF CORRECT SPECIFICATION PRODUCES REAL CHIPS LIKE A MACHINE CUTTER

The modern grinding wheel of correct specifications for the work produces chips like those shown in Fig. 2. Its similar to that of a steel mill- cutter. On the face of the wheel are of cutting teeth at work every and, although these teeth are not as large nor as strong as the teeth of a steel cutter, and cannot cut as deep, they are capable of working at a much greater speed.

In order for a wheel to cut fast and free, it is necessary for it to wear—that is, for the bond to release those grains that have become dulled and useless. From this it is seen that the grain, which has to the greatest degree the physical property of hardness (we refer to mineralogical hardness), combined with sharpness, is the most efficient and will do the greatest amount of useful work before dulling. It is these very qualities that make alundum superior to the softer and more impure abrasive, emery, which dulls very rapidly under cutting pressures.

A set of experiments recently was carried out, showing how the condition of the face of a grinding wheel affects its cutting action, its ability to remove metal and the power consumed in doing this. The results are shown in Fig. 3, which represents the curve traced by the stylus of a Westinghouse graphic wattmeter connected to a motor-driven grinding machine. Section A of the curve shows the no-load power. Then a bar of steel was applied to the wheel under a given pressure and this pressure was held constant throughout the tests. What happened? First, the power consumption climbed abruptly as the sharp cutting grain bit deeply into the metal. After two minutes of this rapid cutting, we reached the glazing point and the line C resulted. At D we were working with a wheel, the cutting points of which were nearly all worn down flat. The power consumption was low because there was practically no useful work being done. The smooth grain simply rubbed and slipped over the bar. At E, the steel began to heat up and get sticky, so that particles began to load and smear into the pores of the wheel face. These respective conditions of the grains are illustrated diagramatically from left to right above the curve. The power now climbed again, but still practically no useful work was being done. At F, or even before

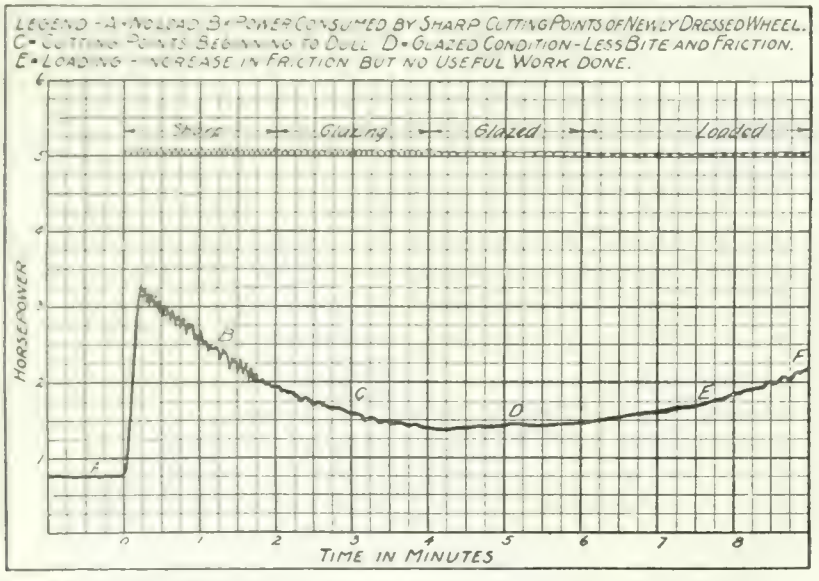

LEGEND - A - NO LOAD B - POWER CONSUMED BY SHARP CUTTING POINTS OF NEWLY DRESSED WHEEL.
C - CUTTING POINTS BEGINNING TO DULL D - GLAZED CONDITION - LESS BITE AND FRICTION.
E - LOADING - INCREASE IN FRICTION BUT NO USEFUL WORK DONE.
Sharp
Glazing
Glazed
Loaded
HORSEPOWER
TIME IN MINUTES
A
B
C
D
E
F

FIG. 3. POWER CONSUMPTION UNDER DIFFERENT WHEEL CONDITIONS.

this point was reached, the wheel should have been dressed or resharpened. This aptly illustrates the folly of using a wheel that is too hard or dense to cut freely without resorting to continual dressing.

Action of an Ideal Wheel

The action of the ideal wheel is pictured in Fig. 4. This shows that the glazing period is no sooner entered upon, than the bond suddenly gives way and releases the dulled teeth. New and sharp grains take their place and the cutting is resumed at very nearly the initial rate. A wheel of the correct grain and grade for the operation at hand can oftentimes be dressed by the additional application of pressure on the part of the operator, or by presenting the very sharpest fins on a casting to the wheel face under increased pressure. This means that useful work is being performed while sharpening the wheel, with practically no lost time or wear of dresser cutters. It is this condition that all should aim for in selecting snagging wheels and the workmen should be educated to this kind of grinding.

Some think that in order to make a wheel cut, you must force it exceedingly hard. This is not true, if the wheel is not excessively hard or fine for the work. A wheel of the correct grain and grade will cut faster if you do not force it too hard. If these points are clearly understood, it will enable you to direct the grinding end of your business intelligently. Failure to grasp the essentials will prove disastrous to economy.

The next factor of importance to economy in the use of the grinding wheel in the foundry is a knowledge of the effect of the physical properties of the metal to be ground. To say that a wheel is desired for malleable iron may not be enough. This expression sometimes covers the annealed malleable and sometimes the white iron before it has been annealed. If the iron is of the annealed variety, then alundum or an aluminous abrasive should be employed, but if the iron has not been annealed, then by all means use crystolon or some carbide of silicon abrasive. Furthermore, the white iron castings usually require wheels of much greater hardness than the annealed castings and this is readily understood when the difference in hardness, density and structure of these metals is known.

It is a common saying that the harder the metal, the softer should be the grinding wheel. Strictly speaking, this applies only to precision grinding, certainly not to the snagging of castings. Let us consider manganese steel, which, as everyone knows, can be machined economically only with abrasives. This material offers a high resistance to penetration and hence slightly finer grits are usually employed for snagging castings made of manganese steel than would be used for ordinary carbon steel. Coarser grits would require more manual effort than could be expected from the ordinary workman.

Soft, stringy materials generally call for comparatively coarse grits and medium hard grades. Dense, brittle materials require slightly finer grains and harder grades, sometimes one or both.

The following table may illustrate this to a little better advantage:

Metal	Grade of Wheel
Manganese Steel Castings	16-Q or R Alundum Vitrified
Carbon Steel Castings	10-U Alundum Vitrified
Brass Castings	24-Q Crystolon Vitrified
Chilled Iron Castings	16, 20 or 24-S, T or U Crystolon Vitrified

It is no doubt well understood that the harder the fins and the sharper the contact, the harder must be the grinding wheel. This is necessarry to counteract the dressing and tearing action of the projecting metal.

Grinding Steel Castings

In grinding steel castings, the breaking-off of gates and risers often leaves a very large volume of metal to be ground away. As the arc of contact thus increases there are increased loading tendencies, and sometimes a heavy, black oil is daubed on the metal, to keep the wheel open and thus reduce dressing. After much experimenting, a specially treated or filled wheel has been developed that automatically lubricates the cutting grains and often greatly lengthens the life of the wheel because of reduced dressing. This filling is not thrown out by centrifugal force; it increases the life of the wheel and many times causes faster cutting action because of the lubrication. In instances where the grinding is of a very rough, heavy nature, this special treated wheel shows up to very good advantage and it would not be economical to use anything else.

to pieces by the percussion set up by the castings on the face of the wheel.

A test conducted by an extensive user of grinding wheels for the purpose of determining whether or not it pays to install concrete foundations under the grinding machines may iterest you. This test was conducted with wheels of the same size and same grain and grade on the very same machines and indentical castings. One set of machines was mounted on concrete or solid foundations and the other on wood or shaky foundation. The results were as follows:

Average life of wheels on wood floor, days	113
Average life of wheels on concrete floor, days	188
Increase in life due to solid foundation, per cent.	65
Average saving a month per wheel on concrete floor	$ 2.00
Average yearly saving per wheel	24.00

Where many wheels are used, this saving is a decidedly large and important consideration. In this case, the concrete foundation paid for itself inside of two months and the saving in wheels will go on indefinitely. As it was, several hundred dollars were saved by this company the first year that concrete foundations were used.

Loose and insecure mooring is also detrimental to the life of the grinding wheel. Don't wait until the machine begins walking around the foundry floor before remedying matters.

Similar figures could be produced to show the saving effected by keeping bearings in good condition. Excessive radial play and end play destroy the wheel rapidly. Many times complaints received to the effect that grinding wheels are not standing up as they formerly did can be traced directly to bearing troubles. The introduction of harder grades, as for example, from grade S to

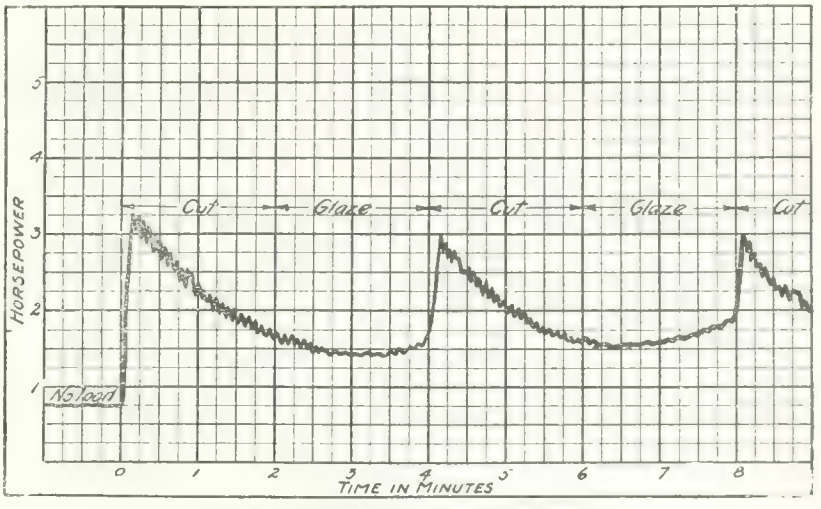


FIG. 4. ACTION OF AN IDEAL WHEEL

We now come to the third factor which has an important bearing on grinding wheel economy, namely, the condition of the grinding machine. Economy cannot be expected if the machines are light and shaky, or if the foundations are not solid. A grinding wheel that vibrates or jumps from any of these causes is soon pounded

grade U, only partially remedies matters because the speed of cutting is sacrificed and the operator has to put forth greater effort to do the same amount of work.

Grinding Large Castings

In the case of the medium-sized or large steel foundry grinding quite a

variety of castings it is important to have the grinding machines properly arranged and grouped, so the work may be ground with a minimum amount of handling.

Extremely large castings that must be ground in place should be gone over with wheels mounted on small portable electric, pneumatic or flexible shaft grinding machines. In the case of the electric machines, all that is needed is a convenient lamp socket or a wall terminal.

Next should come a battery of swing frame grinding machines to handle the medium heavy castings such as drawbars, locomotive wheels and other similar heavy castings that cannot readily be handled. These machines should be located where prompt crane service is to be had. Then finally, the smaller castings that could be easily handled should be ground on floor stands conveniently arranged.

The proper grouping of machines, segregation of castings, and prompt crane service will make for general efficiency in the cleaning operation. This should be looked out for by a man of good judgment, who could also tell where to grind and where to chip. Much valuable time is lost in trying to chip off fins that could be ground off in a fraction of the time and with much less effort.

A table showing the horsepower required to drive various sizes of bench and floor stands might prove of some help at this point. The values shown in this table were measured under actual service conditions and may, therefore, be considered reliable guides in the selection of motors. The table follows:

	Machine	No. of hangers	Friction H.P.	Total H.P.	Net H.P. consumed	Size of motor H.P.	Wheels used in test
[illegible]	Norton Bench Belt-Driven	12	1.08	1.87	0.81	2	2-10 x ¾ at 5000 S. F. P. M.
[illegible]	Ransom Bench Direct-Connected	2	0.75	3.00	2.25	3	2-12 x 1¼ at 5000 S. F. P. M.
[illegible]	Norton Floor Belt-Driven	5	0.95	3.88	2.93	4	2-16 x 1½ at 5000 S. F. P. M.
[illegible]	Norton Floor Belt-Driven	11	1.30	4.75	3.45	5	2-24 x 2½ at 5000 S. F. P. M.
10"x12"	Norton Cylindrical	2	2.50 to 3.00	10.00	7.50	10	1-18 x 2 at 5000 S. F. P. M.

Much has been said and written about proper operating speeds for grinding wheels, but perhaps some important phases of this subject have not yet been made thoroughly clear. Generally speaking, the correct speed ranges for the grinding wheels used in snagging castings lie between 5000 and 6000 surface feet per minute. This is fairly well established and quite generally accepted by the manufacturers of grinding wheels. This range was determined partly by long years of experience and partly by physical laws and the desire for an adequate factor of safety. The engineer building bridges, steel structures, machines and what not, recognizes the necessity for an adequate factor of safety and makes due allowance for it. Similarly, the engineer in making grinding wheels sees the great necessity for a factor of safety in operating speed. All snagging wheels made by reliable manufacturers are subjected to a speed test the last minute before being packed that generates a centrifugal stress many times in excess of the stress prevailing under the recommended operating speed. In the case of the Norton Co., this tested factor of safety runs from 2¼ to 3¼. This, then, is the first limiting factor to wheel speed.

Furthermore, it has been shown there is no appreciable gain from faster speeds, at least not enough gain to offset certain drawbacks. It should be further remembered that the grinding wheel is designed to operate at approximately the recommended speeds and any appreciable deviation calls for adjustments that are not always easy to make or conductive to efficiency.

Keep Surface Speed Constant

It is now common knowledge that it is necessary to keep the speed of the grinding wheel approximately within the recommended range if its productive capabilities are to be maintained. It has been demonstrated that if a wheel's speed is allowed to fall to a very low level, or if it is speeded up beyond a certain point, in both cases reduced cutting ability for the same amount of effort expended is the result. In the case of a sub-normal wheel speed, not only does the productive capacity fall off, but also, there is excessive wheel wear.

To illustrate this point, let us consider the case of an 18-inch wheel, 10 grade U alundum, used for snagging steel castings. At 1175 revolutions per minute its peripheral speed is 5500 surface feet per minute, and it cuts and wears satisfactorily. If the revolutions remain the same, at 11 inches diameter, the surface speed is reduced to 3500 feet. What is the result? Every cutting grain on the face of a revolving grinding wheel has a definite amount of energy stored up in it. It is the expenditure of this energy that enables the grain to do useful work and remove metal. Now the energy available varies as the square of the surface speed. Therefore, at 11 inches diameter, the cutting grains have only 40 per cent. of the energy that they had at 18 inches diameter and they cannot be expected, therefore, to grind as rapidly. Also, because of the decreased energy stored up in each grain of abrasive, it is less capable of withstanding the resistance offered by the steel and hence is more readily torn from its setting. This, then, explains the difficulty that will be encountered in attempting to grind at very low surface speed.

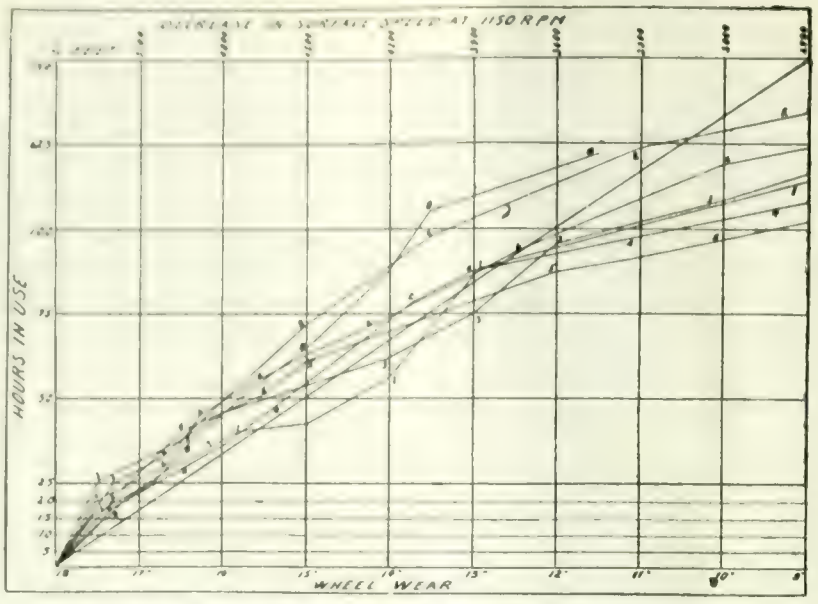


FIG. 5 RELATION OF LIFE OF WHEEL TO SPEED.

On the other hand, if this same 10 grade U alundum wheel was giving satisfaction at 5500 surface feet per minute, and an attempt were made to speed it up to 7000 surface feet, no greater production would be realized. This is due to the glazing effect resulting from the increased duty imposed on each abrasive grain.

Keeping a fairly constant surface speed by increasing the revolutions as the wheel wears down, is the proper procedure for maximum cutting ability with minimum wear. This relation of life of wheel to speed is perhaps more clearly indicated in Fig. 5, representing actual results of tests conducted in a large foundry. The curves show the rate of decrease in wheel life as the surface speed drops off. The continuous straight line is for a wheel lasting 150 hours, wearing uniformly from 18 inches to 9 inches in diameter. Surface speed at the start was 5400 surface feet per minute, and, the revolutions per minute being maintained constant at 9 inches diameter, the sur-

face speed was reduced to 2700 feet.

At 5400 surface feet per minute and full diameter, all of the wheels tested start off at a 200 or 250-hour pace. However, before the speed has been reduced 300 surface feet, we notice a change in the slope of the curve indicating reduced life. At 4000 surface feet per minute, 13 inches diameter, the falling off is most pronounced and instead of obtaining 150 hours of wheel life, it ranges all the way from 100 to 135 hours. Had these wheels been speeded up at 15 inches diameter and again at 12 inches, the 150 hours life would have been more nearly attained.

What Excessively Hard Wheels Lead to

When a user of grinding wheels wishes to avoid the trouble of maintaining fairly constant surface speed, he invariably tries to keep his wheel life up by using wheels of excessively hard grade. The immediate effect of this is increased power consumption and decreased speed of cutting, neither of which are desired. Fig. 6 shows that regardless of speed, successively harder grades require more and more power to remove the same amount of material.

It is, therefore, quite evident from the foregoing that economy in wheel life comes from maintaining fairly constant surface speed as the diameters of the wheels are reduced. This can be brought about by using variable speed motors, or having machines running at graded speeds, to which the worn wheels are shifted at given sizes.

The next point that requires careful consideration is the personal factor entering into the use of snagging wheels. No two men will get the same life or production from a grinding wheel, even though the work and conditions are identical. If the foundry is large and there is a constant duplication of work so that the piece rate can be used, then it is safe to say that harder wheels must be used than where day rate compensation is in force. However, the ideal condition that permits the wheelmaker to specify a free-cutting wheel, is where there is a premium paid for maximum production with minimum wheel wear.

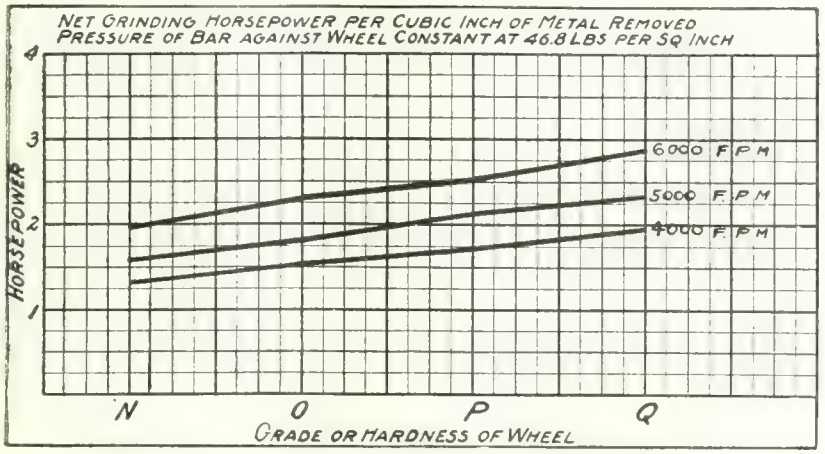


FIG 6. RELATION OF HARDNESS TO POWER CONSUMPTION.

Some men work the corners of the wheel hard, others are abusive in applying the castings, and still others think they must remove a quarter of an inch of abrasive in dressing, where a sixteenth of an inch would be ample. All of these factors have their effect, and must be allowed for. It is, therefore, important that some kind of a record should be kept, showing just how each grinder uses his wheels. Many times the grinding wheel manufacturer is blamed unjustly for apparent variations in wheel life and hardness. In some of these instances the true causes can be attributed to the operation of this personal factor. For instance, if a wheel should happen to be on the soft side of grade S and it should get into the hands of a grinder who was very hard on grinding wheels, a certain life and production would be obtained. Now, in the same lot of wheels, there might be one that varied slightly the other way or toward the hard side of grade S. Suppose that this was used by a man who was more careful in using his wheel. It is evident the wheel would last very much longer under these conditions and hence from a very slight and permissible variation in hardness of wheel we get a result that would indicate a wide variation, if the personal factor is not considered. This is not idle speculation. It is stated from observation of actual cases.

Where there is a constant duplication of work and the piece-rate is used, there is a very simple but serviceable method for computing the relative efficiency of various grinding wheels and operators. The operator's earnings on a given class of work per dollar cost of wheel may be considered, under these circumstances, as a very fair means of determining the efficiency of the particular wheel used. To encourage operators to use their wheels economically, a bonus or premium is sometimes paid for all earnings in excess of a given figure. This works out very satisfactorily and means that the competent grinder is rewarded for his competency. It also invariably means that free-cutting wheels will be used and hence maximum production is obtained.

Records on Snagging Castings

Here are some actual figures obtained from snagging wheels that are interesting:

Life Hours	Weight of Castings Pounds	Average Per Hour Pounds
127	26,543	208
157½	27,043	172

If no records were kept, the wheel with longer life and slightly greater total tonnage would undoubtedly have been picked as the more economical to use. However, the wheel with 127 hours life produced 20½ per cent. more castings a day and the profit on this increased production more than offset the slightly increased abrasive cost.

Another large consumer of snagging wheels keeps a tabular record on printed cards of the following: Date; pieces ground; weight, pounds; hours of grinding; earnings; and wheel loss on diameter. These figures permit the calculation of the abrasive cost per ton of castings ground, and the earnings per ton of castings ground. Manifestly, it is desirable to keep the abrasive cost as low as is consistent with satisfactory earnings per ton. Keeping such records as these makes it easy to pick out the correct grinding wheel, and enables the foundryman to tell just what each of his grinders are doing. He can also tell what the wheel manufacturer is sending him without guesswork or resorting to hearsay evidence from a few of the operators. This is decidedly practical and works for economy. It is time large foundrymen paid more attention to this phase of manufacturing cost, for nowhere is it easier to save or lose large sums than in the cleaning operations where grinding wheels are used.

Here is an example which shows that it is worth while to keep adequate grinding records. A certain large producer of draw-bars was using a hard wheel, 10-W alundum. It had fairly long life and turned out a large number of bars before it was used up. On the other hand, the grinders were continually complaining that they had to work too hard and dress too often. Finally the grinding wheelmakers were called into consultation and a test carried out with several different grains and grades of wheel. The result was the choosing of a 10-U alundum wheel, one grade softer than the W. The complaints ceased as soon as this wheel was put into general use in the foundry, and although the wheels were used up faster, the production was greatly increased and the overhead correspondingly reduced. A brief analysis of this will show up the facts to better advantage:

	Hard Wheel, 10-W Alundum	Soft Wheel, 10-U Alundum
Grinding cost per ton ground	$0.49	$0.55
Total number pieces ground	1800	800
Pieces ground per hour	8	10.2

The use of the softer wheel increased grinding cost 12 per cent., but increased production 27 per cent. and lowered overhead charges because of the increased tonnage turned out in the same time with the same equipment.

Every foundryman who operates a foundry of any size should try and work out a system that would apply to his par-

ticular conditions. Let [illegible] the wheelmaker if necessary and take advantage of whatever experience he has acquired in handling many similar problems. It does not [illegible] investigate, but it is decidedly expensive to continue operations year after year with [illegible] methods of [illegible] and cleaning.

Make Your Wheels Safe

A discussion of grinding [illegible] omy would hardly be complete without some mention, at least, of the necessity of making the use of the [illegible] safe. It is not economy to allow the work to get jammed in between the wheel and the rest, because the wheel undoubtedly would be broken. This is prevented by keeping the rests adjusted close up to the face of the wheel. It is [illegible] to have one or more grinders going to the hospital every little while to have a [illegible] removed from the eye. This can be prevented by supplying an approved type of glass goggle, making the men wear them while grinding. Much trouble also has been caused from flying pieces of chilled iron dresser cutters, which break in the dressing operation. This can be eliminated by using hooded [illegible]. State laws are beginning to call for closer attention to such features.

Apart from the humanitarian side of this question, it is undoubtedly more economical to employ safeguards where rapidly revolving grinding wheels are used than to trust to chance that there will be no accidents. The cleaning of castings is heavy and wearing work at best, and the least that the foundryman can do is to make the working condition as safe and bearable as possible.

LITTLE KNOWN FACTS ABOUT GRINDING

WHEN selecting a wheel for grinding it is important that the grain size in the wheel should be considered, so that sufficient room will be allowed between the grains held in the bond to allow the chips, which will be removed in the grinding operation, to escape and be freed from the grinding wheel. If the wheel is of just the proper grade and grain the face will always remain free-cutting and clear, retaining none of the metal particles as they are ground off the article. According to Howard W. Dunbar, in *Grits and Grinds*, the many varieties of materials which are now being finished in the grinding machine require considerable attention to be paid to this point.

The method of grinding employing the face or periphery of the wheel offers the least trouble or difficulty from this source; but with machines where the grinding is done on the rim of a cup or cylinder wheel it is not only necessary that the wheel grains be of such a size as permit room for the chips but also that the work itself be of such a form that the chips can free themselves as they pass by open spaces in the work. This, of course, relates more particularly to the grinding of castings or parts of irregular shape.

In a machine grinding with the periphery of the wheel the line of contact is "one cut" that chips are less liable to be retained in the crevices between the grains. But on certain kinds of material, particularly those of a soft nature, the wheel is apt to take up little particles of the material and finally crowd them in between the grains in the face of the wheel, which causes a great deal of heat, due to the increased friction of the wheel performing its grinding operation. Furthermore, they cause scratches in the work, the wheel acts hard and is very inefficient.

The grinding wheel can easily be compared to the milling machine in many respects. Deep cuts on the milling machine were not possible until milling cutters were made with coarse teeth to allow room for chips. Similarly, deep cuts in heavy roughing operations in the grinding machine are not possible unless there is room for the chips to free themselves and be carried away from the point of contact of wheel with work. We should, therefore, when deciding upon the method of grinding, and when selecting a wheel, remember that the more and larger the chips we remove, the more room we must provide for them.

PRECAUTIONS NECESSARY FOR THE MAINTENANCE OF CRANE RAILWAYS

Outside crane runways seem to be less rigid than inside runways, possibly because of the fact that the building itself provides some support and thus gives more rigidity to the columns or uprights. Outside runways are also exposed to all conditions of weather, and for this reason as well as because of the constant strains and vibrations, they should receive careful inspection. In case defective members are observed they should be immediately replaced or repaired. Any corrosion or rusting that is observed should be checked by scraping or cleaning off rust and applying a proper protective coating. Runaways that have been in service for a number of years often sway quite noticeably, and sometimes to such an extent that the additional stresses thus produced are dangerous. If this condition exists repairs should be made or reinforcements should be applied, sufficient to restore the runway to its original strength and rigidity.

Effective safety inspection would prevent many of these dangerous conditions, and it should be thorough, regular, and careful. The inspector should not only submit recommendations for the safeguarding of the machines, which is one of his special duties, but he should also consider the possible failure of weak crane structures, spreading or creeping rails and columns, uneven settling of column foundations, and any other trouble that might disturb the proper alignment of runway tracks.

CANADA'S TRADE BALANCE WITH UNITED STATES

STATISTICS of America's foreign trade, issued recently by the Bureau of Foreign and Domestic Commerce, make known Canada's trade relations with the United States to the end of September, 1917. Canada's "unfavorable balance" in these markets has assumed the impressive total of $340,161,166.

The August trade figures of the two neighbor countries showed that Canada was adding to this "unfavorable balance" at the rate of nearly 36 million dollars monthly. A substantial reduction from this extreme rate occurred during September, however. Canada cut her imports from 71 millions in August to 53 millions in September, and increased her exports from 34 millions in August to 37 millions in September.

In Second Place

Canada had climbed into second place on Uncle Sam's customers' list during August, but during September Canada was in her usual third place. The United Kingdom bought a total of 131 millions, and France 76 millions, against the Dominion's 53 millions. Exports to Canada constituted 11.6 per cent. of America's foreign trade for September; 13.6 per cent. for the nine months of 1917. Of the total imports of the United States from foreign countries during September, 15.7 per cent. came from Canada, and during the 9 months of 1917 16.7 per cent. This proportion will be increased now that Uncle Sam has gone to Canada for war supplies.

The reduction in the total of the U. S. imports to the Dominion of 17½ millions between September and August may be accounted largely due to the effect of the embargo on exports, at the direction of the President. Exports of 53 million dollars' worth of American goods to Canada compare with exports of 90 million dollars' worth in May and 94 million dollars' worth in June.

Dominion Trade in U. S.

The following table will illustrate Canada's trade position in the United States at the end of September and at the end of nine months of the calendar year. The figures drawn up give a synopsis of America's trade with the world, the trade done with Canada, and the relation which the Canadian figures bear to those of all nations combined:

	All Nations	Canada	% Can.
	Sept., 1917.	Sept., 1917.	
Exports	$ 467,005,917	$ 53,860,425	11.6
Imports	236,196,898	37,187,671	15.7
	$ 701,202,845	$ 91,048,096	12.9
	Sept., 1916.	Sept., 1916.	
Exports	$ 514,924,134	$ 52,148,637	10.1
Imports	164,038,614	22,649,345	13.8
	$ 678,962,748	$ 74,797,982	11.1
	9 mos. end. Sept., 1917.	9 mos. end. Sept., 1917.	
Exports	$4,616,621,558	$629,238,531	13.6
Imports	2,282,794,503	289,077,365	12.7
	$6,899,416,061	$918,315,896	13.3
	9 mos. end. Sept., 1916.	9 mos. end. Sept., 1916.	
Exports	$3,950,126,079	$427,102,449	10.8
Imports	1,831,174,668	260,794,840	14.2
	$5,781,600,747	$687,897,289	11.8

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

DOES A PISTON STOP AT REVERSAL?

By R. Hamilton

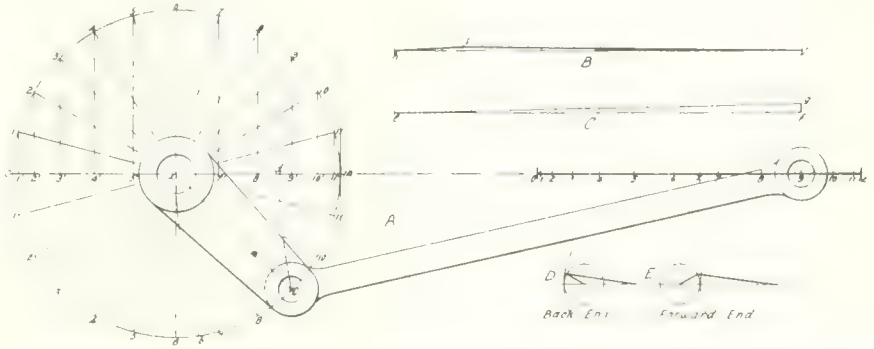
CONSIDERABLE interest has apparently been shown by many readers in the question, does a piston stop at reversal? This is one of those mechanical conundrums that, in itself, has little or no bearing on the actual operation of an engine, but one that will awaken the deepest curiosity in the majority of engineers or mechanics, once they are fairly confronted with the problem. An impromptu reply to this query would invariably be, that the piston does stop at each end of the stroke; but after a little study of the linkage involved, together with the underlying principles of geometry, many are forced to take a neutral stand regarding its proper solution. In the opinion of the writer there are reasonably two answers to the question; that is, theoretically—with absolutely no lost motion in the various connections—the piston does not stop at either end; practically, the piston does make an infinitesimal stop, owing to the fact that it is impossible to make a fit of two moving parts that will be entirely free from lost motion. This looseness, even though imperceptible, is nevertheless present.

On the basis of a theoretical solution, we must realize that if a stop is made it will be when the engine is on either of the dead-centers; that is, when the center of the crank, the center of the crank-pin and the center of the cross-head pin are in the same straight line. We know that this condition exists during each revolution of the crank; so the question now is, how long are these three centers in the same straight line? The geometrical definition of a line is that it has only one dimension, that of length. Therefore, if it has no thickness and the crank is in motion, there can be no stop on the line. The two extreme positions on this line constitutes the points known as the dead-centers of the engine. Again we are faced with the definition that a point indicates position only; it has neither length, breadth or thickness. As the circle described by the crank-pin is not a straight line, it is a logical conclusion that no portion of it is a straight line; so that it is quite obvious that, on the forward stroke the maximum distance between the center of the crank and that of the cross-head is not attained until the dead center is reached, when the action of the cross-head and other reciprocating parts, is immediately reversed.

A factor that should be thoroughly understood in the study of this problem, is that of the relative motion of the crank and cross-head pins. The uniform motion of the fly-wheel causes the crank-pin to pass through similar circumferential distances in the same period of time. When this rotary motion of the crank is converted—by means of the crank and connecting rod—into the reciprocating movement of the cross-head and piston, the action of the cycles are uniform, but each cycle of the reciprocating parts consists of a gradual accelerating and retarding motion, occurring twice in each revolution of the crank. By referring to the sketch it will be seen that the crank-pin circle is divided into a certain number of equal parts, illustrating the uniform action of the crank-pin. If the reciprocating motion were obtained by means of a slotted link, the corresponding positions of the cross-head or piston would be indicated by the points on the horizontal diameter derived from the vertical projection of the points on the crank-pin circle. However, with the general practice of using a connecting rod, as here shown, there is a slight variation in the acceleration at either end, due to the angularity of the connecting rod. This is clear from the arcs X-B and C-D. The graduations on the line O-12, to the right, represent the horizontal movement and position of the cross-head for the corresponding positions of the crank-pin.

The position of the cross-head can be readily determined when the crank is at any point in its path of travel. By using the length of the connecting rod as a radius and striking an arc from the center of the crank-pin to the horizontal diameter, this intersection will be the relative position of the cross-head between its extreme points of travel. The variation in the retarding or accelerating motion of the reciprocating parts may be better understood by referring to sketches D and E. When the crank-pin is approaching the back end dead-center, the crank and the connecting rod are overlapping, and the arcs that would be described by their outer ends would be tangent in the same direction, whereas on the forward end the opposite action evidently takes place, with the obvious result, that for the same arc traversed by the crank at either end, the speed of the reciprocating parts would be greater at the forward end, as indicated in the lengths O-1 and 11-12 on the graduated cross-head traverse line.

In order to form a triangle we know that the sum of two of the sides must be greater than the length of the third side. With the exception of the "dead-center" positions, this condition always exists in the constantly changing positions of the moving parts under discussion; therefore the solution of the "stop" query may rest on these facts. A skeleton diagram of the linkage approaching the forward "dead-center" is shown at B; 1 representing the crank-pin. Until the point 1 coincides with the straight line H-J, the triangle is still existent, and the length H-I-J must be greater than H-J; but, as a line has no magnitude, the time required for the crank-pin to pass over or through it must be nil—therefore no stop is possible (theoretically). Diagram C is an exaggerated skeleton sketch of the center line of the crank nearing a "dead-center;" E-F-G forms a right triangle, E-G being the hypotenuse, so that the latter must exceed the length E-F until it is in a direct line with it. Some of our readers might advance their arguments as to how long it takes the crank-pin to pass this "line."



ILLUSTRATING REMARKS BY R. HAMILTON WITH REFERENCE TO REVERSAL OF ENGINE PISTON.

MAGNESITE BRICKS NOW PRODUCED IN BRITAIN

By T. J.

IN THE search for highly refractory materials to resist the intense heat of the steel furnace the valuable properties of magnesia claimed early attention, and fire-bricks made of calcined magnesite took very high rank. The supply of magnesite, an impure carbonate of magnesia, the raw substance employed, was largely in the hands of foreigners, and

and entirely in Austrian hands, but very ing made in England from the magnesite procured from Greece and the bricks are superior to those hitherto ob- be due to unequal contraction of the components of the brick, or to some defect in calcination. The Austrian bricks contained a larger percentage of iron in combination with the magnesia than those made from the Grecian magnesite, amount of an iron compound to the raw material good results would be obtained. This has not hitherto been found to answer, but experiments are being made which already give promise of good results. Some kinds of bricks made from fireclay and pure silica show much the same defect in use as those prepared from the Grecian magnesite.

GOVERNMENT INSPECTION OF AIRPLANES

SPEAKING on this subject in the presidential address delivered before the Institution of Automobile Engineers, London, Oct. 10, 1917, Lieut.-Col. R. K. Bagnall-Wild succeeded in conveying to his hearers some idea of the magnitude of the task of properly inspecting every individual part entering into the construction of the machine and the necessity for a huge corps of skilled and meticulous inspectors, the better to serve the mutual interests of the manufacturers and Government. To quote the concluding remarks of the address:

"Inspection is essential to obtain efficient output. It is the only method whereby the directors of a company can ascertain the quality of the firm's output; it is their only safeguard that money, time and material are not being wasted in production of scrap; it is a check on their purchasing department; it is a check on their design and drawing office; it is even a check on their chief engineer to whom the inspection branch is responsible. Facts will always speak and the inspection department can at any moment produce figures showing rejections at any stage from the purchased raw material to the completed and finished article.

"It has been suggested that a full Government system of inspection is but a For a long time I have had available a record showing rejections by the firm and rejections by me. These figures, of course, also give the percentage rejections on the total and they must surely be of vital importance, not only from the outside point of view, but financially. A little more money spent on inspection not only increases dividends but brings in more orders. The better the article, having due regard to cost, the greater its popu-

"The inspector, as a rule, is nobody's friend. This is not always his fault, it is a fault of the whole system; he should be encouraged to be human. He must not be on unduly intimate social terms with the production staff, but he must be capable of dealing with them with tact and cordiality. I am certain that if more attention were paid and more encouragement given to the class of man employed by firms for this purpose, much better results would be obtained."

Some idea of the thoroughness of the inspection, the minute attention given to every detail and the continuous check on every operation may be gained from a perusal of the three inspection forms appended, relating to the cylinder, piston and crankshaft of the rotary engine, which formed part of the presidential address.

Cylinder

Ideal Firm's Inspection Procedure, with Reference to the Manufacture of a Cylinder for a Rotary Engine.—1. It is given that the specification for the material is mild steel, 0.4 to 0.5 carbon, to conform to R.A.F. Specification 29a.

2. The main contractor orders rough-machined stampings from the sub-contractor X (whose method of manufacture the main contractor has approved). These stampings are to be supplied in the annealed condition, and samples of the test pieces from the bar material of which the stampings are made to be supplied.

3. Sub-contractor X orders approved material from sub-contractor Y, who is a steel manufacturer, and quotes approximate analysis which he considers desirable to meet the conditions required in the manufacture of commercial stampings, and which will be in accordance with specification 29a. He also asks for a copy of a test certificate of the material taken at some approved test-house.

4. The stampings made by sub-contractor X are delivered to the main contractor, who arranges the machining of the stampings through various operations, until the cylinder is completed and ready for fitting to the engine. The inspection arranged for by an ideal firm in their own works, and in agreement with the sub-contractors in their works, would probably be as follows:—

(A) Steel Manufacturer Y. — The casts of the steel which the contractors propose to supply are analysed; each ingot of the steel is examined, and an inspector decides the amount of cropping necessary from each end. The cropped ingot is then passed through to the rolling mills, where it is hammered and rolled into suitable bars. Inspection of the bars is made for roakes, pipes or seams, and all defective material is rejected.

During the manufacture inspectors check and record the temperatures of rolling and working. A sample test piece is cut from the bar and forged down to the ruling dimension of the shell of the cylinder stamping. This test piece is then normalised, and tests are carried out at an approved test house; if all the bars are made from one cast, probably one or two test pieces only will be taken. A copy of the certificate will be forwarded to contractor X, with possibly some spare test pieces; the bars will then be delivered to the stamper.

(B) The stamper X, on receipt of material with certificate, will immediately put in hand the stamping of the cylinder shells; inspectors will arrange to check temperatures of working throughout the whole process.

On completion each cylinder shell will then be annealed, the temperatures being carefully checked and each stamping Brinelled. A sample of the material will be hammered down to the ruling dimension of the shell, and will be annealed at the same time as the stamping. This sample piece will then be machined as a test piece and Brinell and tensile tests taken. The Brinell numbers of all stampings should conform to a definite range, based on the test pieces, and, providing the tensile figures of the test pieces are satisfactory, the stampings will be approved.

The stampings will then be passed to the rough-machining shop, and the skin removed, care being taken to retain the identity numbers. After inspection for surface flaws and general dimensions they will be passed for delivery to the main contractors. In the main contractor's works the stampings will then be passed to the various machines for the remaining operations, inspection taking place between each operation as per the following schedule:—

(1) Rough turn on outside to chuck jaws, rough drill or bore, and face end.

(2) Rough counterbore working barrel, rough turn outside to chuck jaws, face end, rough bore valve-seat diameter, bore working barrel, finish internal-conical head, rough form outside taper.

(3) Rough bore and recess for valve thread, rough turn outside diameters, face to overall length, form top angular face.

(4) Mill flat for sparking plug boss.

(5) Rough form fins.

(6) Anneal and sand blast.

(7) Turn tops of fins, finish form first nine fins, finish tops of first nine fins, and polish same.

(8) Drill hole for sparking-plug boss.

(9) Chamber hole, and weld in sparking-plug boss.

(10) Finish bore working barrel, chamber mouth of bore.

(11) Form diameter at crank-case end, face shoulder and form grinding recess, form remainder of fins, finish valve-thread recess, polish remaining fins.

(12) Cut valve thread.

(13) Slot-mill keyway castellations.

(14) Drill oil holes.

(15) Grind crank-case register.

(16) Grind working bore.

(17) Balance cylinder.

Before final finishing the cylinders will be annealed to remove machining stresses. Final machining will be carried out in order to bring the cylinders within the standard weight limits and in addition to adjust the centre mass of the cylinder to the right position.

Inspection will be carried out on the finished cylinder for all final dimensions, weight and centre of mass. The inspection as arranged by a Government department, assuming that they have no control, or are not aware of the contractor's inspection, will be as follows:—

(a). The ingot from which the bars will be made at the steel manufacturer's would be inspected, and particulars of ingot and analysis of the cast taken. During the rolling of the material the temperatures of the rolling will be taken occasionally. The complete bars will be submitted for inspection, and will be checked for dimensions in accordance with the international standards or particulars of the order. One test piece for every 20 bars will be taken, and after working down will be normalised and a test carried out. Each bar will then be Brinelled, and if within a satisfactory agreement the bars will be passed on the results of the test piece, and a certificate and release note issued.

(b) On receipt of stampings the material will be inspected and checked against the release note. The operations on the stamping will be periodically inspected, the temperatures being checked from time to time. The samples of the material will be taken, and after working down to ruling dimensions will be heat-treated with the stampings by a test piece representing each batch of stampings. The stampings will then be inspected for dimensions in order to ensure that sufficient material is available to allow for cleaning up. Each stamping will then be Brinelled, and if the test piece is satisfactory, and the Brinells are reasonably consistent, the stamping will be passed after general inspection for flaws, etc.

(c) On receipt at the main contractor's the stampings will be checked by the release note, and released to the machine shops. No further inspection will be carried out beyond the transference on the stamping number. The finished cylinder can be identified with an individual stamping. The finished cylinder will be inspected for all dimensions, weight and centre of mass, and if satisfactory will be stamped and approved.

The action which a Government Inspection Department would probably take with the ideal firms would be as follows:—

(a) The checking of the analysis of the cast will be taken, periodic checking of the firm's own inspection would be made as regards rolling temperatures, working, etc. The test pieces would be pulled and material passed as usual procedures.

(b) At the stamper's periodic checking would be made of working temperatures, and a check test of the heat ment made periodically at random, and Brinell report for each stamping examined.

Cylinders will be selectively examined for flaws and general dimensions, and finally accepted and released to the main contractor.

The main contractor's inspection fixtures would be examined, periodic selective check testing be made between operations, and also of the finally finished article. Should any defects be discovered the whole of the batch concerned would be examined, otherwise only selective examinations would be made.

On final erection of the cylinders into the engine, check examination will be made to see that the various fits are satisfactory, and should any of these points show discrepancies, a detailed examination will be made of all stock in stores. All spares, unless erected in the engines at the main contractors, would be examined in detail for the dimensions affecting the fit, functioning, or the strength of the part.

System of Production of Cast Aluminum Piston

Material—Aluminum Alloy, to Specification of L. 8.—When casting, three test pieces are cast for every eight pistons. The pistons are numbered when taken from the sand, and the test pieces, removed in the fettling shop, are sent to the experimental departments for tensile test and chemical analysis. If these tests are satisfactory and approved by the A.I.D., the pistons are released and pass into the foundry view-room. Here they are inspected for blow-holes, and the inside diameter of the barrel callipered for size; the correctness of position of the gudgeon-pin hole is also tested on the surface table. If approved they pass from this room into the casting store.

The store issues them to the machine shop on a machining order, and in this shop they go through the following operations:—

(1) Rough machining outside, both on sides and crown. Viewed at site of lathe for blow-holes, etc.

(2) Finishing turning on sides and crown, leaving only enough metal for grinding operation.

(3) Bored at mouth and faced down to correct depth from inside crown.

(4) Rough drilling of gudgeon-pin hole to 1 in., and facing bosses inside.

(5) Cutting and rolling two ring grooves and scraper ring groove.

(6) Drilling hole for set pin.

They now pass into the grinding shop for—

(7) Grinding true to size on the outside diameter, and return to the machine shop for the following operations:—

(8) Finishing facing and rolling crown.

(9) Milling oil groove.

(10) Finishing boring gudgeon-pin hole, and then into the machine shop test-room, where

(11) They are tested under 10 lb. per square inch water pressure.

At this point they again return to the machine shop for—

(12) Burnishing gudgeon-pin hole.

(13) Drilling drain holes around scraper-ring groove.

(14) Number rolled on.

After all operations from the second to the fourteenth they are taken to the section view-table for inspection, and finally are weighed, have the weight stamped on them, and then are—

(15) Polished on crown.

This completes the machine shop operations, and they pass into the final view-room before going into the finished store, accompanied with view note. This view note bears the chief inspector's stamp, without which the pistons would not be inspected in the final view-room.

The finishing store then issues them to the erecting shop, where they are fitted to the connecting rods, etc., the operations being:—

(16) Rings fitted on and lapped.

(17) Assembling with connecting rods.

They are then finally viewed, tested for correct weight, and passed on to the charge hand, who again inspects them generally all over before he allows them to be assembled in an engine.

After assembling in the engine they pass on with the engine to the test bench, and then to the stripping shop, where they are very carefully examined for scoring and wear on rings, etc., and the gudgeons pins removed and replaced before they are again assembled with the engine for the final test. If this test is satisfactory the engine then passes on the despatch shop for despatch.

Engine Crankshaft

Material—Forged Steel, to Specification K. 1.—The crankshafts are stamped in Sheffield, have test pieces cut from the ends of the shaft, and are tested there before being approved and released by the A.I.D. for despatch to contractors.

They are issued by the stores at the contractors to the machine shop, on a machining order, where they go through the following operations:—

(1) Centre shaft.

(2) Saw off test pieces and stamp number in the presence of the A.I.D.

(3) Re-centre.

(4) Rough-turn journals, ends of shaft and faces of webs, leaving enough metal for grinding.

Viewed at View-table No. 1

(5) Number re-stamped on side of web.

(6) Milling sides of webs for locating purposes.

Viewed at section view table 1.

(7) Milling sides of webs parallel.

(8) Turning crank-pins and facing webs for grinding.

Viewed at section view-table 1.

(9) Form mill radius at crank-pin and journal ends.

(10) Grind radius.

Viewed in main view-room.

(11) Drilling and tapping holes through crank-pin.

(12) Drilling through centre of crankshaft.

Viewed in main view-room.

(13) Hand tap crank-pins for oil plugs.

(25) Frazing webs.

Viewed in main view-room.

(26) Screw threads cut on both ends.

Viewed in main view-room.

(27) Drilling holes for balance weights.

(28) Drilling and countersinking oil holes in crankpins and journals.

Finally viewed all over in main view-room and component number stamped on

The crankshafts now pass into the finished store on a view note, from which they are issued to the erecting shop, where they undergo the following operations:—

(29) Tapping and plugging oil holes in journal ends.

(30) Plugs removed, oil holes drilled through them, replaced, and set pins inserted in ends of these oil holes.

(31) Balance-weights fitted.

Viewed for balance on section view table 3, and numbered as viewed.

Oil-ways tested under pressure of 200 lb. per square inch with lubricating oil. Stamped with viewer's number.

(32) Key fitted to keyway in taper end.

Viewed for the taper and keyway at vice.

(33) Main ball races fitted.

(34) Bevel gear and locking nut fitted.

(35) Taper gear and ball race and locking nut fitted. Final viewing, length between housings of journal bearings gauged, and fitting of taper gear tested. Stamped with view mark.

(36) Split pin hole for castle nut at taper gear end of shaft drilled, also hole in sleeve nut drilled.

(37) Journals stoned for removal of frays, etc.

(38) Journals bedded in crank-case bearings.

Viewed at work bench, and stamped.

(39) Fitting connecting rods to pins and stamping recognition numbers on webs and connecting rods.

Viewed at bench for play in connecting rods.

This completes the actual operations of construction of the crankshafts, and they are then passed to the erecting shop, where they undergo a final running test on the test bench, and if satisfactory is sent to the despatch shop for despatch.

MACHINING A LARGE COMPRESSOR BED

By D. S. Mann.

IN taking up the manufacture of a line of compressors in a shop which had previously been devoted to the production of smaller machinery it was found necessary to get out the first machine as there were no other shops in the town capable of handling the work, and it was absolutely impossible to obtain new tools in time. The largest lathe with which the shop was equipped was a 32 in. and the headstock was blocked up with the two sets of raising blocks. As the work was only boring and facing, which was comparatively light work, the extreme height of the headstock did not interfere with taking good, heavy cuts.

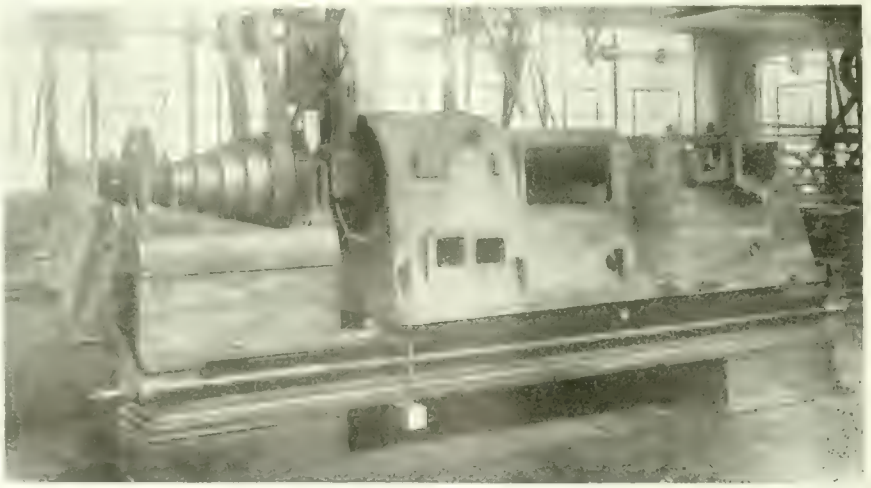
The tailstock and carriage were removed and the bed clamped directly to the ways, resting on metal pieces, bringing the center to the desired height. The boring bar screwed on the spindle and was provided with a travelling head carrying the boring tools. The travel of this head was controlled by a screw lying in a slot milled the entire length of the bar. The outer end of this screw carried a gear which engaged with a small pinion which rotated freely in the center, supporting the outer end of the bar. This pinion was milled on the end of a piece which extended back into the center and a hole was drilled both through the pinion shank and the center proper. When a pin was inserted through this hole the pinion was held stationary and the rotation of the boring bar about the center caused the gear on the end of the screw to also turn and thus move the boring head. To stop the feed it was only necessary to remove the pin when the pinion in the center would turn freely.

It being impossible to provide any external support for the center, a casting was made which extended across the bed and was held to same by studs, the casting being provided with screws whereby it could be adjusted vertically to secure alignment with the boring bar. It was, of course, necessary to drill the holes for these studs after the bed was lined up on the lathe but this was a small matter with an electric drill. After boring out the bed for the crosshead the end was faced with the facing head shown at the inner end of the bar.

After getting the machine on the lathe, the actual boring and facing time was practically no longer than what it afterward was on a regular boring mill. Of course, it was rather awkward to line up properly and the operator was at a slight disadvantage due to the height of the work.

Unique Portable Drill

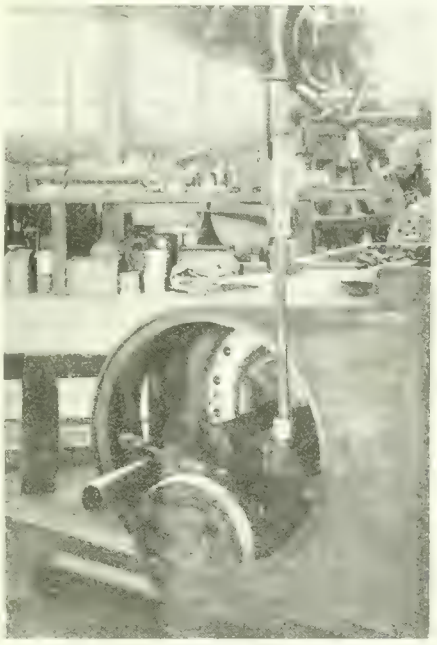
The cylinder was fastened to the bed by studs placed horizontally and the most logical machine for doing this work was, of course, a horizontal drill press, as the extreme weight of the casting made it practically impossible to place it on end in a pit and there was also no pit available at the time. An old blacksmith's drill head was obtained and mounted on the three-inch pipe attached to a central flange. A crude universal joint was arranged on each end of the bar from the radial which allowed sufficient range to drill several holes at the one setting. The drill was fed by the handwheel shown at the end. The distance from the center of the drill to the center of the pipe was, of course, the radius of the stud circle. In spite of this rather crude method of doing this work, it was completed in good time and with perfect satisfaction.



TEMPORARY ARRANGEMENT FOR MACHINING COMPRESSOR BED ON LATHE NOTE BLOCKS UNDER HEADSTOCK.

Needless to say, machinery was pur-

chased to handle the above work in a more efficient and modern manner after the success of the first machine was assured, which was directly after being placed on the market, but the methods used only go to show the versatility of modern machine tools and operators as well.



UNIQUE APPLICATION OF BLACKSMITH'S DRILLING MACHINE DRIVEN BY UNIVERSAL SHAFT FROM RADIAL DRILL SPINDLE.

MISCELLANEOUS CARD RECORDS

By B. Orion.

THE accompanying card records do not represent the practice of any one firm nor are they connected in any particular sequence, but show different forms which the writer has seen used with success. No. 1 shows a time card which was used in a small shop in which there was absolutely no system whatever except what the foreman carried either in his head or private notebook. All estimates were based on guesswork, and in an endeavor to get some kind of cost on the main parts which went into engines, he used this card and filed them according to symbol. The card was used only on those particular jobs on which he desired costs. To keep a record of purchases Nos. 2 and 3 were used in different instances.

A card index, containing card No. 4 was maintained in a certain pattern vault and only one man was allowed to either get out or return patterns. In this way the index was always kept up to date and there no patterns lying around, there being a place for each, and each in its place. Should the patterns be taken out for purposes of repair and later returned, a record was kept on the reverse side.

A similar card, No. 5, was used in the tool room for jig storage. This contained all information pertinent to that particular piece and came in useful when taking inventory as no jig or fixture was allowed to be placed on the shelves until a card was made out for same. When a jig became obsolete it was not destroyed for some time and the card was then transferred to the obsolete file. When the jig was finally destroyed, the card was sent to the office in order that the proper charge could be made. Where there was any possible chance for confusion a freehand sketch of the jig was made on the back of the card.

Nos. 6 and 7 were used in the drafting room as a record of tracings. They were filed according to both part and drawing number. In looking up a tracing number reference was almost always made to the part number. The costs on the card were supposed to be average and often came in useful when the question of redesigning or new methods of manufacture came up.

No. 8 was used in the toolroom to locate the prints for handing out to the workman. A man called for print for part B39. Turning to card 39, shows that size B is a 40 H.P. and the print number is 1138.

A similar drafting room record is shown in No. 9. In this case the drawings were filed in large envelopes or folios. This is very similar to No. 6 except that there the prints were filed according to number only.

Symbol C.46.. H. P. .15.....
TIME CARD
Date 4-27-13..... Machine No . 6.....
Name of Part ....Piston.....
Operation ...Turn & Groove.....
.....
Time Start .8:25... Time Finish 3:30.....
Elapsed Time .....6:05-.5.....
Average Time per Piece .....1:01.....
Operator's rate per Hr. .33¢ Cost per Piece $.38
Operator Wilson..... Remarks Cost 15 min.....
.....with lathe trouble.....

FIG. 1.

PURCHASE COST CARD
Article Lubricators.....
Mfgr Johnson Mfg.Co Fig No 19 Size 6 - Feed.

FROM WHOM PURCHASED	List	Disc.	Net	Date	F O B
Johnson	24.75	20-10	7.2	10-19-15	Fact

FIG. 2.

Form No 3
QUOTATION RECORD
ARTICLE Ignition Coils.

DATE	BY	FILE	FROM	TERMS	RECEIVED
3/9/6			B L. Keith Co		6-10/6 6

FIG. 3.

Name of Part Cylinder Head. Part No A39.
Wood ✓ Metal ... H. P.. 25
Rack A Tier 3 Shelf 7
Number Core Boxes 3
Number Used Per Engine 1
Other Sizes Used on ———
PATTERN RECORD

FIG. 4.

Part No A39 Jig No 396
Bin No A Shelf No 3
Operation Milling Bosses
Type of Jig Box
Jig Made 3-21-16 By Brown
Total Actual Labor Cost $10.45
Total Material Cost $3.18
Qual Using
Superseded by Jig No
TOWER MFG CO JIG RECORD Sketch Over

FIG. 5.

Symbol A39 Draw No 1096 Book No.
Name Cylinder Head
Material C I
Aver weight 49.
Material cost $6 76
Labor cost $10 18
Total cost $16 94
Last engine used on

HP	T	No	HP	T	No
10			40		
15	Y	1	50		
20			60		
25			80		
30			100		
15					

FIG. 6.

Draw No. 1096 Book No. Date 7-3-13

Contents	Part No.	Contents	Part No.
Cylinder Hd.	A39		
Valves	A41		

Superseded 10-21
Chgd 3 Plate .035 to A - 1-24
Copied to Waterous 1-27-14 .961
Copied to Steerum .1154
Copied to Scout .1171

FIG. 7.

39	Cylinder Head	
A	35	1 C
B	40	1138
C	50	1103

FIG. 8.

SYMBOL 57
NAME Cam Gear
No 6
DRAWING NO 18
PART OF GROUP NO
MATERIAL Steel Cstg.
PER WEIGHT 7#
WHERE BOUGHT Ill. Steel Co.
MATERIAL COST $1.05
LABOR COST 38
TOTAL COST $1.43
LAST ENGINE USED ON
CHANGES Lengthened Hub ½" 1-04

WHERE USED: A 10 HP, B 20 HP, C 30 HP, D 5 HP, E 6 HP, G 8 HP, H 10 HP, J 12 HP, K 14 HP, L 16 HP, M 4 HP
NO. PIECES: N 3 HP, P 4 HP, R 30 HP, S 2 HP, T 3 HP, U 5 HP, V 7½ HP, W 9 HP
TOTAL 1

FIG. 9.

DO THE BIG THINGS, LIVE THE BIG LIFE

By James E. Conley

THE only difference between man and animal is always thanks, as stated to prove to contrary. It is because of this fact that man sets himself a superior being. His superiority however, must be judged by that of which he thinks, the way he thinks, and what his thoughts carry forward to. Since the dawn of time, from the beginning of the world's history, from Noah's days and Flood, from Cæsar's day even to this man has made but very little effort to keep his thinking powers has given but little attention to real, genuine constructive thinking.

Man as a rule acts after he thinks, and that the depth and reach of his thinking has been feeble and of little extent is proved by the necessity (at least to him) of the constant repetition of wars and upheavals of revolutionary character. And because of this, because these things have been repeated over and over again, then carelessness and futility, the little gained by destruction instead of construction; while the tigress still exists in woman, the wolf in man, there is little to distinguish man as being above the grade of animal, or in being a superior actor on the world's stage.

When we say man is crude and is low on the scale of progress, and are asked to explain how and why, we can, in a manner, anticipate this same question by referring back to those who existed and took their turn at life a thousand years ago.

The plain truth is that with all our vauntings of intellectual superiority, and the little we have achieved and progressed, we still border on the pale of crudity. Insanitary practices that still exist, and neglect of that in which we are deeply calloused must, to a future race, stamp us as untutored, abnormal and crude, even as those who slew their game with jagged stones and roasted it on spikes are to us now. We call this an enlightened age, but our methods and refinements are no whit higher than those in the dark ages. Our fears are just as strong, our superstitions and ignorance just as deep; we are still as quick to quake before each thunder-clap or new celestial phenomenon as did our forbears in days of old.

The World Waits Not

The world propounds a new problem every hour. No waiting, no getting ready or taking our time method, is going to put any of us in a class fitted to probe and dissect with any degree of success in the solution of these. If we persist in moving at our old gait we will never rise from our condition, never enter the new era that is only waiting to materialize when our energizing forces are put into play. We are carelessly neglecting, putting off and leaving for some future generation of men and women to do that which we could readily do ourselves in the present day.

Out of the distant past we have slowly evolved—but all too slowly. Under a misconception we have dreamed of an Eldorado, a sweet by and by, a land flowing with milk and honey, which we would fall heirs to when we shed this mortal coil. The fact is, the city of the blessed with its streets of golden pavement and its crowns of glory could be easily brought down to us and established under a wise and select administration right here now if we would quit cheating ourselves with these uncultured notions, come right down to business and get busy. There should be no mis-spent years, no wasted lives, no moral weakness, no down-in-the-gutter type of human being. Every man should be strong; every woman should be strong; every child should be strong; there should be no reservation required on this earth for a weakling or a pigmy.

That we can become a higher and greater type; that our refinements and accomplishments can be surpassed beyond all that we at present can conceive; that we can attain to a state of unrivalling wealth and grandeur is no idle or delusive boast. And all it requires of us is persistent and energetic action on the part of every human being. No delayable, no-laying-aside-and-waiting-awhile kind of motion; but instead a vitalizing, constant perseverance, that gathers in, and gathers abundantly what we incessantly and determinedly must strive for. The earth should be a hive, and everyone a positive, strenuous bee-ing.

The Fruits of Labor

No labor should be too large, no task too small, no distance too great to compass, no depth too low to explore. Out of the bowels of the earth, out of the sea and air, could we bring untold treasures and substance, if we only would begin to stir up our energy. There is no plant or flower but would disclose its secret; no mineral or quartz but would yield forth its value; no sweeping wind, no atmospheric element but would extend and render its health and wealth to us striving mortals. Are you willing and wakeful to the splendor of these possibilities? Are you willing to move in all this grand assembly of earth's products? Are you willing to sharpen the edge of your intellect? Are you willing to plunge forward with powerful momentum? Are you willing to pass your hand through the shower of sparks that flit and fly from the anvil of life, forging a link to the chain of this steady movement from the morn's first ray to the evening's glow? Can you stand unpropped, unswayed by useless strifes and turmoils? Can you shoulder a load, solve a burden, bridge the gulf of ignoble pursuits and low aims? Have you the forwardness, the straightwayness to ends that are primed with vigor and push? If this be you, then come. Step forward where an, as yet uninhabited, arena awaits you. Come where your faith is worthy of your steel. Come unto your own. Unmindful of your comfort, your sleep or your meals. Make your existence worthy of the flesh that adorns you. Ascend a mountain peak, grasp a cloud, place guide-posts along ærial pathways, and become a satellite in the firmament of the heavens.

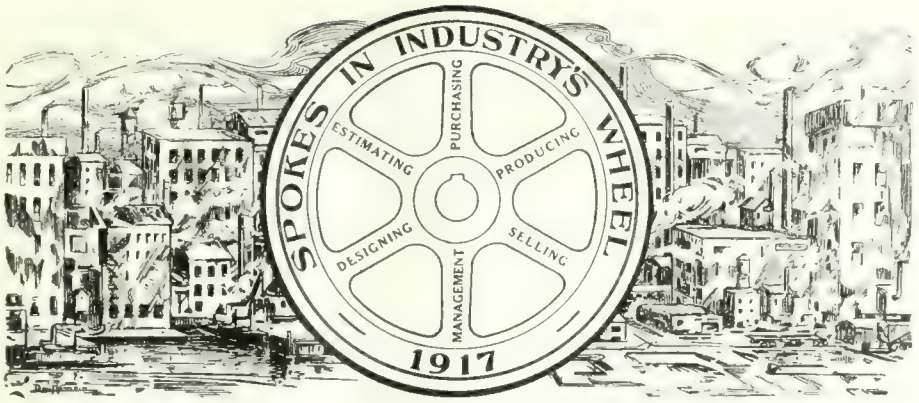
Awake to-day to your unfathomable possibilities. Feel the great stir within blood and sinew, in vein and ligament. Walk daily forth with constructive zeal — with constructive ideas — with indestructible calm. Over and over again repeat to yourself, that youth is nothing, that old age is nothing, that only live human activity is of consequential moment. Set your face towards the broad sunlight of unquenchable energetic fires, and do the big things and live the big life.

Under the vast dome of sky—over the wide expanse of earth—no matter where you are, move onward and forward in some great human endeavor. Be punctual to the second in your labor unswervable, unconquerable and bristling with activity. Be zealous and unafraid! Wholly determined! Wholly invincible and energetic! Be a real, live human being, high in your aims, high in the service that calls you. Be of that faith which never wavers, falters nor halts. Be above the common order that shuns and shirks. Bowl down that which obtrudes. Stand firm where others weaken. Upheave the dens of darkness. Be a glittering light in unceasing action, a being of heroic mould.

DUTCH shipbuilders are required to give details not only of all ship construction and repair, but of the ultimate destination of the vessels. The shipbuilder or owner receiving German iron and steel must sign a contract, valid for five years after the war, that he will not sell any ship without giving Germany the right of refusal, and that during five years after the war he will not allow his ships to be employed, directly or indirectly, for the benefit of Germany's present enemies. The Dutch Government Iron and Steel Committee has advised builders and owners not to accept these last two conditions.

WHEN selecting a cooling liquid the matters which have to be considered are the nature of the material to be cut and the kind of tool used, the effect of the lubricant, its freedom from liability to gum and clog pipes, and, as important as either, its cost when a large establishment is concerned. But this is a relative matter, since if a costly oil or mixture be selected it may well prove more economical than a cheaper one if an efficient recovery plant is installed.

A TANK steamer is building in a shipyard on the Delaware whose engine-room, says *The Marine Journal*, will present the novelty of having no reciprocating machinery of any kind. The propelling engine will consist of a low and a high-pressure turbine geared to a single propeller, a surface condenser with a centrifugal pump driven by a turbine, two centrifugal hot-well pumps also driven by a turbine, and a rotary oil pump for the turbine and gears, driven from the main gears. This is the first instance, adds the journal, where rotary machinery has been used throughout a ship, which marks an epoc in shipbuilding history.



The constitution of industrial enterprise is largely departmental—"spokes in a wheel." This series of articles has for its object the featuring in a racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting, effectively, energy in their capacity as "spokes in the wheels" of our metal-working establishments.

WILLIAM JAMES McSHANE

NOT the least prominent of those sections of the Dominion affected by the industrial activity of the past three years is the province of New Brunswick. While affected to a considerable degree by the demand for munitions, the urgency-inspired development of shipbuilding has, to a greater degree perhaps, been responsible for the present state of activity in this particular section of the busy East. When the influence of agricultural and allied interests in a generally prosperous district are considered, the ultimate demands on establishments doing a general engineering business are both large and varied. Considerable interest, therefore, attaches to the personality of the subject of these remarks, whose lifetime association with a leading New Brunswick engineering firm has resulted in his reaching a responsible and trusted position therewith.

Canadian born of Canadian parents, William James McShane first saw the light in St. John, in the year 1865, and to-day, after 35 years in the service of T. McAvity & Sons, discharges the duties of chief draftsman and pattern-making superintendent. While much of Mr. McShane's success is no doubt due to the guiding influence and tuition of his father who held the position before him, it is no disparagement to his parent to remark that the developments of recent years have brought greatly increased responsibilities and demanded a degree of judgment and resource largely exceeding the old days when our Spoke was absorbing the rudiments of his lifework.

The day schools of St. John were his source of knowledge until the start of his apprenticeship with McAvitys in 1883, at the age of eighteen. The regular 5-year period of training was gone through by Mr. McShane, and the fact that this formative period of his life was spent under the supervision of his father has doubtless been a matter of mutual benefit to our Spoke and his employers on many occasions since. Doubtless Mr. McShane reasoned that a part of the country which was good enough for a firm like McAvity (they had been established almost half a century when he joined them) was quite good enough for him, and the determination to do well whatever came to his hand accounts for his following the example of his employers and becoming also, so far as lay in his power, long established.

WILLIAM JAMES McSHANE.

The name of McAvity is a household word in the Maritimes, as will be gathered from the nature of their business. Established in 1837, they developed with the country, operating the Vulcan Iron Works and a separate plant devoted to brass work, producing plumbers', steam fitters' and engineers' supplies while recently a machine shop of considerable size has been rendered necessary to meet their requirements. The wide field of activity open to a studious, resourceful and energetic person in the position filled by our Spoke is apparent, and that Mr. McShane fully availed himself of the opportunities offered is evidenced by the numerous inventions, etc., in the various lines produced by McAvity. Numerous types of valves, fittings, electric railway semaphores and corporation specialties are the fruit of his efforts or bear the impress of his influence in some form or other.

The close attention to work necessary to insure such a record may account for the comparatively small amount of traveling done by Mr. McShane but the requirements of his position did not prevent him from following the advice contained in the old saying about "all work and no play, etc.," and his record in rowing matches and similar sports is evidence of his physical as well as mental ability.

Our Spoke is of the Liberal persuasion in politics, is Roman Catholic in creed, and beyond being a Knight of Columbus has few society affiliations. His belief in the value of temperance is well seconded by his efforts for the cause, and he acknowledges that much of his success has been due to his close ties with the Father Matthews Temperance Society. He has been bereaved through the death of his wife, and resides at 27 Duke St., St. John, N.B.

In speaking of his career, Mr. McShane attributes most of his success to having "acquired practical experience, at the same time developing the ability to back it up by the study of technical books and journals, the former to keep the rudiments of knowledge always fresh, and the latter to maintain close touch with recent developments in products and equipment, and acquire a knowledge of the methods and devices employed by others."

TENDENCY IN MACHINE TOOL DEVELOPMENT

THE effectiveness of any specific machine in the modern industrial establishment is measured by its ability to do work for which it is intendel with the greatest possible economy, while features of permanency and adherence to standard and approved design may be of secondary importance, according to Joseph Horner in an article in a recent number of "Engineering."

Various occurrences and movements of magnitude may contribute to render excellent machine tools antiquated in the sense of being no longer sources of profit, and this long before they manifest marked signs of wear. Conditions arise which result from changed views respecting methods of tooling. Others are caused directly by the advent of new industries. Both are largely responsible for many alterations in the designs of the later machine tools. Both have been extremely active during recent years. Each aspect would offer a tempting field for a more extensive treatment than can be ventured on in connection with the

Hand Work Superseded

much tedious correction by hand work to accuracy, and with uniformity, in any grinding machines have changed practice quantities of work away from other tools, performing it, if not always with finer results, yet with more rapidity than the Output is multiplied by the employment of multi-spindle machines, as drills, boring machines and some turret lathes, in which from four to half a dozen spindles are carried. It is also increased by the grouping of several tools in some modified designs of common lathes, and in many box tools in turret lathes, in vertical boring and turning mills carrying several tools, in crank and cam turning and grinding machines, and so on. In the selection of machines and methods immemorial practice does not count, but the ultimate results rather are visualized, and methods are subordinated to them. Times are carefully collated, with the object of saving minutes or even seconds. The expense of fixtures, and even the high cost of additional machines, are brought into their true perspective instead of being allowed to bar the way to the real economies of production. These changes are revolutionary in character, and they would impress the mind more powerfully than they do but for the fact that they are growing familiar to the generation that is being trained in them. But the older men, who witness the inevitable displacement of handicraft in which they were trained and exercised, marvel at the banishment of individual initiative in machine-tool methods by the automatic and semi-automatic systems, the cards, and the routing methods.

Influence of New Industries

Changes which arise directly out of the advent of new industries are even more prominent than are those that are consequent on divergent views of me-

study in alternative ways. Their adoption or neglect in their ultimate results may involve success, or loss, or even total occupied by operations in question, but limits or degrees of inaccuracy are involved. Sometimes the attainment of the results desired will entail a larger expenditure of time, in others less, perhaps very much less. But the ultimate issue is the thing that matters. The conditions that are imposed, the results to be achieved, control the methods to be adopted.

The newer industries which are exercising most influence in controlling the work of the machine shop are chiefly those that are concerned with the manufacture of all kinds of internal-combustion engines, the manufacture of steam turbines, that of electrical machinery, and, now partly overshadowing these, of munitions of war, which includes mechanisms of many kinds made in vast quantities, many articles being ordered by the hundred thousand. For each of these many highly specialized tools, many absolutely unique designs of machines are employed in addition to large numbers of modified types of the kinds that are regularly standardized. The problems which have been exercising the manufacturers of motor engines and vehicles and aeroplane details have had to be faced under greater difficulties by the firms who have been engaged in munition work.

Single Purpose Results

One of the remarkable phases of the solution of the problem is the enormous development of what are termed the "single-purpose" machines, or those which are specialized to the last degree. Many of these only perform one operation, some include two or more operations which are identical or allied in character. Equally striking has been the effect of the extensive employment of fixtures and of jigs, and, again, the general use of the tools of high-speed steel. The influences which these three modern movements have on an accelerated output, and, in consequence, on the services of the machine tools, may be noted briefly.

The single purpose machines are big developments of an earlier movement. Their growth has been immensely quickened and favored by the intensive production of munitions. The problem of how to secure the most rapid output has been the paramount one, and any tools, however novel in design and without precedent, that might help to gain this end have been welcomed. These machines are justifying their existence, because they increase output by subdivision of tasks, and because they enable the large contingent of unskilled and semi-trained labor which the war has attracted to the shops to be utilized. This movement, which though not new, its swift growth assumed the of a novel phenomenon, is greatly exercising the judgment of those who to accommodate shop arrangements to changed conditions. One might enumerate more than a hundred new designs of this class, the products of the last three years, for dealing with munitions alone, to perform only one or two, or a few, related tasks.

The influence which these single-purpose tools are exercising will not cease with the termination of the war. The question of the position which they may occupy in the future is of less importance than that of the retention or the improvement of the system of which they are an essential element. Many of these machines, and others, embodiments of the same methods, might be readily enlisted in new services in the intensive industrial war that must supervene. They are essential if the dilution of labor is to be retained. The principal machines the work of which has been encroached on by the single-purpose machines are the lathes, followed closely by that of the drills. A few observations on the first-named will show why the single-purpose machines are, in the opinion of many competent judges, to be preferred to the more complicated general-purpose designs.

Unskilled Labor Unsuitable

At the commencement of the war there arose a huge demand for common turret lathes, which the supply was inadequate to meet. It was rightly believed that the possession of these would enable an immense output to be secured. But two requirements are essential if the best results are to be secured from such lathes —a supply of skilled tool makers and tool setters, and operators who have acquired some experience in their working. The supply of each of these requirements proving insufficient for the abnormal demands made afforded the opportunity and emphasized the necessity for the introduction of the single-purpose machines. These are vastly cheaper to produce than turret lathes are, and they exact the minimum amount of tool setting, and can be operated by new attendants after a very little instruction.

Although turret lathes are automatic or semi-automatic in their movements, an operator who is neglectful or insufficiently experienced may easily allow tools to become slightly displaced or damaged, and by continuing to use them while in these conditions spoil a considerable volume of work before the gaugers detect the fact. Especially is this the case with the more elaborated boxes of tools that are fitted with slides, setting-up screws, tightening screws, and often with multiple tools. The more numerous these fittings are, the more liable is trouble to result when a neglectful, inattentive or half-trained man is in charge. Another fact to be observed is that the time spent in preparing and setting up batteries of tools and the fixtures or boxes in which they are held is a large item, since many trials may have to be

(Continued on page 633.)

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

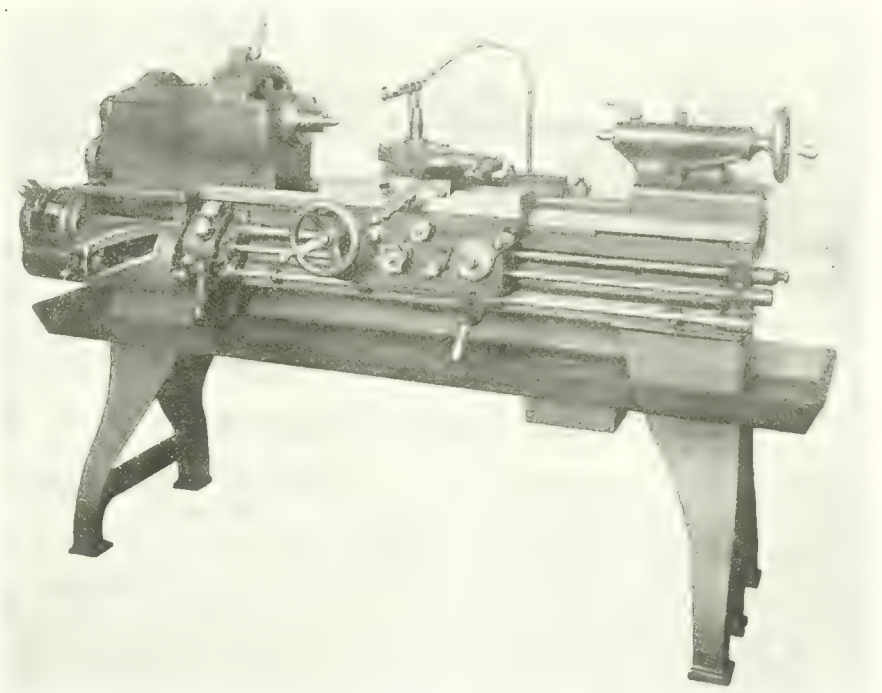
NEW DESIGN TOOL ROOM LATHE

IN the tool room lathe illustrated in the accompanying engravings the Davis Machine Tool Co., Rochester, N.Y., have incorporated refinements in design and construction which make it particularly capable of meeting the requirements of a modern tool room where accuracy, convenience, power and simplicity are demanded.

The headstock design involves the use of a heavy one-piece casting, having solid boxes with front and rear walls brought up to the centre line of the spindle, thus tying the whole head together in a most substantial manner. Gear guards are made to be integral with the head and form a cover for the cone which makes a safety device in conformity with the laws of most States. In the top of the gear guard is mounted a brake for stopping rotation of spindle, a device much appreciated by skilled operators.

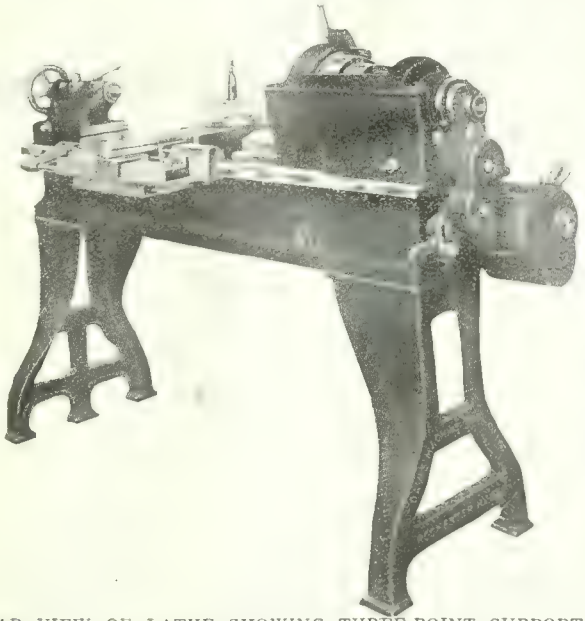
The spindle made from high grade crucible steel is turned all over and ground to micrometer size, and runs in heavy phosphor bronze boxes scraped to fit and to accurate alignment. Large oil pockets are cored in the walls under the centre of each bearing, and the oil is distributed from them by rings, thus furnishing a constant and even lubrication.

Front spindle bearing is tapered, and wear is taken up by drawing spindle into taper. The rear bearing is keyed to and slides on spindle, and is adjusted by a collar on the end which draws same into taper bronze box. End thrust is taken by hardened steel washers and S. K. F. self-aligning ball bearings. A 1½ in. hole is bored entire length of spindle with front end bored to No. 8 Jarno taper.



TOOL ROOM LATHE HAVING HEAD WITH INTEGRAL GEAR GUARDS AND BACK GEARS ARRANGED BELOW SPINDLE.

The back gears are placed under the head stock at the front end of the spindle. This arrangement applies the drive from the cone through the gears without the long eccentric shaft and quill used on all cone-driven lathes, thus eliminating all torsional strains. Back gears are brought into mesh by a handle placed at the front of the lathe, making it unnecessary for the operator to reach over the cone as in the old construction.



REAR VIEW OF LATHE SHOWING THREE-POINT SUPPORT, TAPER ATTACHMENT, AND CLEAN APPEARANCE

The carriage has a bearing on the ways of 19¼ in., with a cross bridge of 6 in. wide, all surfaces being accurately scraped to bearings by surface plates. Compound rest swivel base is graduated and provided with four clamping bolts for locking some in position. This construction permits very heavy cuts to be taken without and deflection in the rest. Full length taper gibs are provided in both cross and compound slides with end screw and adjustment for taking up wear.

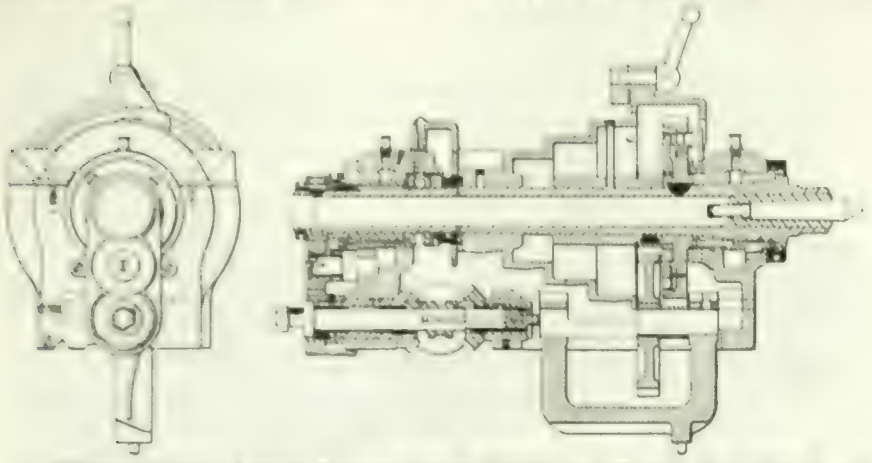
A double plate type of apron is used with two bearing supports for all shafts. Rack pinion stud can be withdrawn when lathe is used for screw-cutting. A central oil pocket is arranged to lubricate all bearings from one point. Longitudinal and cross feeds are controlled from apron and both can be instantly released under heaviest cuts, and an interlocking gear is provided to prevent both the feed and the half nut being engaged at the same time. Feeds are obtained through an independent feed rod and the quick change gear box, without the use of lead screw. They are 36 in number and vary from 4½ to 240. Feed rod can be locked in or out by means of clutch placed next to the gear box.

Screw-cutting equipment provides for a range of threads from 1½ to 80 per in., including 11½, instantly obtained through the quick change gear box. Thirty-six leads regularly supplied, but others can be cut by changing gears on the quadrant. Lead screw is made from machinery steel 1¼ in. diameter, turned all over, and is guaranteed for accuracy; the maximum error allowed being .001 in. in 12 in. All gears in gear box are cut from solid bar stock on a gear shaper.

Reverse mechanism for the carriage is operated by lever, placed at right hand of apron, which controls a sliding clutch under head stock giving right or left hand travel to the carriage through a set of accurately planed bevel gears. This arrangement permits spindle always to run forward, and thus doubles

the number of spindle speeds by driving both pulleys on countershaft in same direction. Duplicate or shoulder work can be performed by means of adjustable stop and adjustable collar.

Principal dimensions are: Swing over bed, 14¼ in.; over carriage, 8¼ in., between centres, 27⅝ in.; size of tool, ½ in. x 1¼ in., floor space, 28 in. x 6 ft.; net weight, 1,400 lbs.

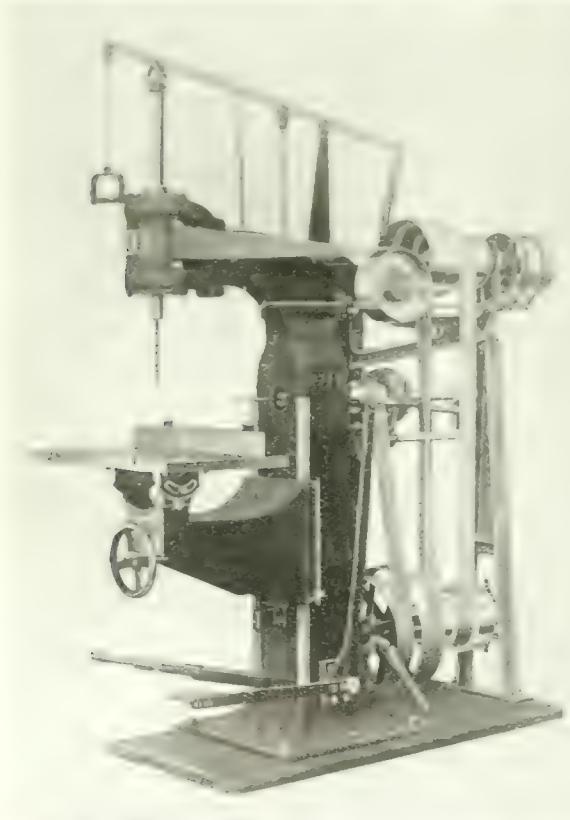


SECTION OF HEAD SHOWING BACK GEARS UNDER FRONT END OF SPINDLE, AND ARRANGEMENT OF BEVELS FOR FEED REVERSE.

To facilitate correct alignment, a foot is placed in the centre of the right leg so as to carry the lathe on a three-point support, the outer ends of this leg being supplied with adjusting bolts, which can be screwed down till they just touch the floor without taking any of the weight. Regular equipment with 5 ft. 6 in. bed consists of large and small face plates, compound and steady rests, one set of round centres, double friction countershaft and necessary wrenches. Special equipment of usual description can be furnished, including motor drive, taper attachment, relieving device, etc.

UNIVERSAL WOOD-BORING MACHINE

THE universal vertical and horizontal wood-boring machine shown in the accompanying engraving is the product of the Oliver Machinery Co., Grand Rapids, Mich. It is designed to meet the requirements of pattern-making and other wood-working shops, being adaptable to heavy boring work, as well as to a variety of jobs such as drilling holes in metals and doing the work of a router, shaper, buzz planer, when equipped with the proper cutters.



UNIVERSAL WOOD-BORING MACHINE.

The column is a single casting about 8 ft. high, bolted to a sole plate and fitted with both horizontal and vertical spindles, each capable of drilling holes 3 in. dia. and under. The vertical spindle is 1⅞ in. dia. and slides in a sleeve formed by the projecting end of the driving pulley, which ends are fitted with ball bearings. The tool end of the spindle is bored to receive a ½ in. straight shank tool or may, when specified, be threaded to receive a 3-jawed chuck. The upper end of the spindle is connected through a thrust bearing and link to the lever arm which is operated by either foot treadle or hand pull to feed the tool to the work. The vertical travel of the spindle is 12 in.; its pulley dimensions 5 in. by 4½ in., and speed 3,000 rev. per min. when adapted for single speed only.

The horizontal spindle and ball bearing arrangement is similar to the vertical, but is supported by means of a bracket attached to the column at a height of 16 in. above the table top, with the table at its lowest position. It is driven by a pulley 4½ in. by 4 in. at a speed of 3,000 R.P.M. if supplied with one speed only, and has a forward travel of 7 in. controlled by a foot treadle and coiled spring which latter returns it to normal position.

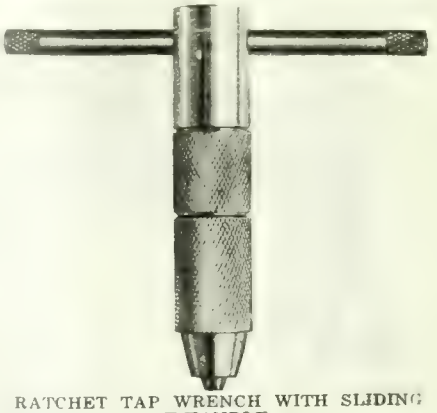
The 18 in. by 30 in. table has vertical adjustment of 17 in. obtained by hand wheel and feed screw. It is pivoted on both ends of a curved slide arranged at right angles to the pivots, the amount of tilt in either direction being such that the table can be inclined up to 40 deg. to or from the column and 30 deg. crosswise, the angle of setting being read from the graduated scale on the rockers.

Two types of this machine are supplied—single speed and four speed—which differ only in respect to the countershaft arrangement and both types may be furnished with from 3 to 5 h.p. motor drive as the work demands. Standard equipment consisting of five 6 in. twist bits of sizes, ¼ in., ⅜ in., ½ in., ⅝ in., and ¾ in. is supplied with every machine. The single speed machine occupies 70 in. by 38 in. floor space and weighs 2,000 pounds; the four speed belt driven machine occupies 73 in. by 38 in. floor space and weighs 2,300 pounds.

RATCHET TAP WRENCH

THE accompanying engraving illustrates a ratchet tap wrench which has recently been placed on the market by the Moss-Ochs Co., Cleveland, O. It is made in two sizes: No. 1, from 0 to ¼ in.; No. 2, from ¼ in. to ½ in.

The device is of strong and substantial construction and consists of a chuck mounted on a shank provided with a double acting ratchet. The T-handle fitted to the upper part of the shank is held centrally by means of a dog which automatically fits in a flat milled on the handle. When required for use in corners and other difficult or awkward situations, the handle slides to either end which action, combined with the ratchet



RATCHET TAP WRENCH WITH SLIDING T-HANDLE.

movement, removes considerable worry from the operator, avoids to a great extent the breakage of small taps, and enables more accurate work to be produced.

The ratchet is immediately adjustable for right or left action by simply turn-

ing the milled sleeve shown above the chuck. All chuck and ratchet parts are carefully hardened while the workmanship throughout is of a high grade.

PROHIBITED IMPORTS INTO SOUTH AFRICA

W. J. EGAN, Canadian Trade Commissioner in South Africa, has notified the Department of the deletion of certain articles from the list of goods heretofore forbidden from being imported into South Africa.

The amended list, therefore, of prohibited imports at present is as follows: —Adding machines, advertising matter, automobiles for town use, unless required by medical practitioners or for other urgent purposes, books, canned food, cigars, clocks, clothing, condiments, confectionery, cutlery, cutting machinery, films, furniture, furniture polish, garden appliances, hops, jewellery (imitation), motorcycles, novelties, oil-cloth, ointment, phonograph goods, photographic goods, pictures, pianos, playing cards, printed matter, sauerkraut, scouring powder, shoe polish, slates, sporting firearms and ammunitions, sporting appurtenances, toilet requisites, tobacco, toys, vacuum flasks, watches.

MACHINE SHOP RESPONSIBLE FOR MARINE ENGINEERING PROGRESS

DESPITE the marked advantages of hydraulic and electrical transmission systems for ship propulsion, the use of mechanical gearing seems destined to become the most widespread on the all important grounds of economy and general applicability. The reasons for such a belief were advanced by Alexander Cleghorn in his presidential address to the Institution of Engineers and Shipbuilders in Scotland when he reviewed the main features of progress in marine propelling machinery during the past ten years.

Generally speaking, the reciprocating engine about a decade ago had given place to the direct turbine for warship, fast liner, and Channel types; had compromised with it for vessels of the intermediate class; and had refused to recognize it as having any claims on that extensive class comprising the low-speed types. But even under these conditions the solution to the problem of achieving the general applicability of the turbine had come into view through mechanical gearing. Ten years ago this was in little more than its embryonic stage; about three years later it had reached the experimental stage; then followed rapidly its promotion to the proposal lists and the stage of tentative application by the more courageous. Now it occupies the proud position of the standard type, demonstrating its universal application by the rapid displacement of the direct coupled turbine, the combination system and the reciprocator from the respective positions in which they had established themselves. Its superiority over all these types, in the essentials of economy, weight, and space, is unquestioned, and its reliability is at least as certain.

Concurrently the growth of the rival methods of hydraulic and electric transmission is seen, but while each of these systems has its particular advantages over the geared type, neither can meet it on the all important grounds of economy and general applicability. The mechanical system at present makes the pace and that pace at present seems likely to be rather too severe for the other forms.

But gearing in its rapid advance has hardly halted at the single spur and pinion drive. The double arrangement is now coming largely into use and this apparently minor development is obviously the special demand of the slow speed ship wherein the reduction ratio for suitable revolutions of the screw is very large, though its utility is not confined to the low power, low revolution equipment. There has also been a marked revival in the marine use of superheated steam. Thus the latest achievement of this period of restless progress in steam-propelling machinery is the superheated-geared-turbine equipment, transcending its forerunners in practically all respects and marking an epoch of advance without equal in marine engineering history.

TENDENCY IN MACHINE TOOL DEVELOPMENT

(Continued from page 630.)

made before everything is quite shipshape. This contrasts strongly with the simplicity of the equipment of the single-purpose machines.

Another aspect which concerns turret-lathe work that may not be neglected when comparisons are being made is this: In order that the lathe shall be worked at its fullest efficiency all the tools must complete their performances in a single cycle, or often, in small pieces, two cycles may be worked off in one revolution of the turret. But in making up combinations of tools, the speed is set by that of the operation which occupies the longest period, and the others lag. The multiple-spindle automatics are machines of general utility which have been pressed very largely into the service of shell work by the employment of special adaptations of tools. They labor under the same kind of disability which affects the ordinary turret lathes, namely, that the length of the major operation sets the pace for the others. Because of these facts the single-purpose machines have often been preferred to the turret lathes, even though some re-chucking and re-setting are entailed.

And thus, since every single item in a piece of work—a motor part, an engine detail, a shell section—may be the subject of alternative treatment, the individual selection of methods must ultimately be determined by the character of the machine tools which happen to be already available, or which can be obtained with the least delay; or, if the choice is not limited, by those which are most adaptable to the class of labor to be obtained and to the production of a maximum output.

Screenings

"Well, I'd be ashamed if I had as bald a head as you. Look at my head of hair!" "I just want to ask you one question." "Yes?" "Did you ever see grass growing on a busy street?"

Pat, who is "somewhere in France," had just received a letter from ould Ireland. Being unable to read, he called in the aid of the chaplain, who readily agreed to decipher it for him.

But Pat was not wholly happy. Drawing closer to the reverend gentleman, and lowering his voice to a whisper, he said:

"I hope it's not angry ye'll be, sorr, but as the matter is of a very private nature, do you moind puttin' your fingers in your ears, sorr, whilst you are reading it out?"

When Slapdash Jones went home for the holidays the first thing his mother took out of the trunk was an overcoat, and on it was pinned a pawnbroker's ticket he had inadvertently omitted to remove.

"Halloa! Ha, ha!" cried Slapdash. "They must have forgotten to take this off at the Smith dance when I left it in the cloak room. Eh—what?"

A moment later his mother took out his evening trousers. Unluckily, they, too, bore a ticket.

"Why, Slapdash, dear," she exclaimed, "you surely didn't leave these in the cloakroom, too?"

An officer, far from popular with his men, coming to camp one evening, was almost drowned in a river swollen by recent heavy rains. He was rescued by a private in his own regiment. The officer was duly grateful, and asked his preserver how he could reward him.

"The best way, sir," said the soldier, "is to say nothing about it."

"But why?" asked the astonished officer.

"Because, sir," was the reply, "if the other fellows knew I'd pulled you out, they'd chuck me in."

A penitent-looking man was on trial for vagrancy and disturbance of the peace. The judge seemed inclined to be lenient with him.

"What was the prisoner doing when you arrested him?" he said to the policeman.

"He was having a very heated argument with a cab driver, your honor?"

"But that doesn't prove that he was the worse for liquor," the judge said. "Many sober people have arguments with cab drivers."

"So they do, your honor," said the policeman, "but in this case there was no cab driver."

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OUR PRESENT AND FUTURE DUTY

FINAL returns coming to hand as these lines are written indicate that again, as on previous occasions, the Dominion has done what was expected of it, and, having assured the twofold success of the Victory Loan, may now turn to other than financial efforts with renewed energy and corresponding but long looked for success.

Beyond all question, the ultimate fate of every individual is hourly approaching final decision. Where the lives of nations are measured in thousands of years, of empires in hundreds of years, the months marking the duration of the present war are as days and weeks of battle as minutes. Viewed in retrospect in the yet distant future, the efforts now put forth by many of us will assume their true proportions in the struggle, and that, which in these few fleeting days seems worthy of admiration, may then well receive little more than scant acknowledgment at the hands of historians.

Much stress is laid by present-day economists on the necessity of being prepared for the era of reconstruction following the war, but these are all based on hypotheses of a more or less personal nature, and influenced entirely by the side of the opposing forces to which the theorist is allied. It is presumed, no doubt rightly, that industrial activity will continue unabated till desolation and destruction are replaced by habitation and production, but,—that which is destroyed in a day cannot always be replaced in a day, and what is more to be considered, as the war with its tremendous expense drags on, is,—the cost of the war will not cease when the last gun is fired.

When the most recent German war loan was floated it was observed that the amount of money necessary annually to pay the interest on the cost of the war to Germany, up to that time, would require four times the amount ordinarily raised in peace time by taxation of the people. Presuming then that Germany was preparing to carry out a program of reconstruction, is the German nation going to increase an already enormous cost of existence by assuming further obligations for the benefit of those whom she had overrun and pillaged? Why is it that circumstantial reports from generally reliable sources continue to give information regarding the systematic removal of industrial assets,—plant, machinery, raw materials, yes and human beings, too? Can this be the conduct of a nation with which we may [illegible] with in the world's markets without soiling our hands? Can we, least of all, again trade with that aggregation of monsters and handle, utilize, and perhaps eat the product of their country?

No! Not so long as an unredeemed Victory Bond remains in the possession of self-respecting Canadian workmen will the memory of present events permit such happenings. Great as will be the benefit to our country through the splendid efforts of all in making the loan a success, its effects on our national and individual policies in the future will be still greater, less spectacular, but more lasting, a constant reminder and incentive to each one of us that the best and only the best of what is in us must be given freely to justify the unparalleled safety and immunity in which we go about our business.

Efficiency, that oft-quoted word worn threadbare in its meaning through misuse and overuse, must become the motto of each bondholder. Production, not profits, must know no limits if our nation is to become an Apollo and carry its share of the world's burden in years to come. Credit sufficient to restore civilization to some semblance of its former self must be given and accepted freely by all, and the manner in which labor plays its part during the next decade or two will in large measure determine the rapidity and thoroughness of the world's recovery.

The necessity for proper government control of Victory Loan bonds will therefore be evident, in view of the number and disposition of individual subscribers, and the efforts of unprincipled parties to pull off profits through unscrupulous market manipulation cannot be too strongly condemned, especially in the interests of future loans. The faith of the small investor must remain unshaken always, and if such an undesirable development is permitted to occur, and small investors, who have been argued into buying by the assurance that they can get their money back at any time, find that they have been deceived, it will mean that many new investors will receive such a bad opinion of government bonds that they will not buy again.

The remedy is easy,—a prohibition of the sale of bonds under a certain fixed minimum. This regulation could be enforced as a war measure and it would work no hardship to anyone, except perhaps the unpatriotic few who are declining to buy now in the expectation that they can pick up the issue at bargain levels a little later on.

SHIPBUILDING ACTIVITIES INADEQUATE TO THE EMERGENCY

A LATE wire from Washington, D.C., covering the first annual report of the United States Federal Shipping Board, indicates that the present powers of the latter are totally inadequate to meet the existing ocean freight service emergency arising from German submarine activity. Additional powers, it is claimed, are necessary, so that control may be had of ocean freight rates, and the regulation and supervision of shipping generally. The Board declares that not the least of the problems confronting it is the threefold one of getting, keeping and training men for their respective tasks and duties.

Vessel tonnage of mammoth quantity is under construction and on order on or near every waterway, lake and ocean coast of the United States and Canada, yet there is little doubt that the work as a whole is not marked by that progress which is so desirable, because so urgent. The frank statement by the Shipping Board of its inability to cope with the situation without extended powers is in no sense a confession of weakness, rather is it a warning, originating from expert conviction to those whom it serves, that measures more drastic be enacted and become operative without delay.

INDUSTRIAL NOTABILITIES

VICTOR GARNET CURRY, director and vice-president, Canadian Car & Foundry Co., Ltd., Montreal, Que.; director, Canadian Steel Foundries Co., Ltd., Montreal; director, Pratt & Letchworth Co., Ltd., Brantford, Ont., was born at Amherst, N.S., Sept. 8, 1882, son of Senator N. Curry, LL.D., and Mary (Hall) Curry.

After receiving his education at Rothesay Collegiate School and Royal

CAPTAIN VICTOR GARNET CURRY.

Military College, Kingston, he started with Rhodes, Curry & Co., Ltd., Amherst, 1901, this company being amalgamated with the Canadian Car & Foundry Co. in 1909.

Capt. Curry joined the Victoria Rifles as lieutenant, 1910, and was promoted captain, 1913. He went overseas with the 14th Batt. (First Contingent) being second in command of No. 3 Company R.M.R., and was invalided home July, 1915.

Motoring, yachting, fishing and shooting are his principal recreations; he is also a member of the Engineers' Club and the Country Club. His society affiliation is A.F. & A.M.

In politics, Capt. Curry is Conservative and in religion Episcopalian. He married Maude Chapman, daughter of David T. Chapman, Sept. 14, 1905, and resides at 581 Sherbrooke St. W., Montreal, Que.

Photo courtesy International Press

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

FINISHED IRON AND STEEL

Steel hoops, Pittsburgh	3 50

*Government prices.

FREIGHT RATES

	Per 100 lbs. C.L.	L.C.L.
St. John, N.B.	35.1	45.5
Guelph	18.9	22.1
London	18.9	22.1

METALS

	Montreal	Toronto
Spelter	10 50	10 50

Prices per 100 lbs.

PLATES

Tank plates, 3-16 in.	13 10	12 10

WROUGHT PIPE

Standard Buttweld

Size	Per 100 feet	
½ in.	6 46	8 03
1¼ in.	16 33	20 59
7 in.	190 40	238 00
10 I. in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

Standard couplings, 4" and under

OLD MATERIAL

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
No. 1 machine composition	21 00	20 50
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast		
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts 7-16 and up.	net
Plate washers	List plus 20
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square, tapped	add 1 75
Nuts, hex tapped	add 2 00
Copper rivets and burrs, list plus	30
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40

	Per cent.
Eq. & Hex. Head Cap Screws	20
Rd. & Fil. Head Cap Screw	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in. plus	10
Studs	net
Taper pins	10
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washer	net
Hollow set screws, list plus	20
Collar screws, list plus	30, 10
Thumb screws	20
Thumb nuts	6
Patch bolts, add	40, 10
Cold pressed nuts to 1½ in., add	$4 50
Cold pressed nuts over 1½ in., add	$7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Cut nails	5 70	5 80
Miscellaneous wire nails	60%
Spikes, ⅝ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

MISCELLANEOUS

Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Putty, 100-lb. drums	1 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Gas, English	0 3-
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single bbls.	1 42
Linseed oil, boiled, single bbls	1 47
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. list plus	20
Emery cloth, list plus	33 1-3
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 41
Plumbers' oakum, per lb.	0 09
Packing, square braided	0 31
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 35
Pure Manila rope	0 30
British Manila Rope	0 28
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ¼-in. and up.	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks, list plus	30
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill	list plus 10
At warehouse	list plus 50

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable tipped unions, 40.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$ 9 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand 10⅜ oz. galvanized	12 25	12 00
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S	13 75	9 70
Premier, 10¾ oz.	13 85	10 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

	B
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$36 00	$
1¼ in.	40 00	
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.		58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	85
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16
Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11½
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	50 to 54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to 25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14 x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base	64 00	60 00
Braziers', in sheets, 6 x 4 base	57 00	52 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 55

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

Success of Victory Loan will benefit Canadian industries. More shell orders to be placed. Steel and metal markets quiet.

THE astonishing success of the Victory Loan will be a source of gratification to the country at large and will assure a continuance of prosperity. Canadian industries will benefit through the expenditure of this vast sum of money as it will be all spent in Canada. The munitions industry will benefit to a greater degree perhaps than any other, as a considerable proportion will be appropriated for the manufacture of shells. Already arrangements have been made to place large orders for shrapnel, 4.5-inch and 6-inch shells, which will keep a number of plants actively employed for several months. As a result of these shell orders, another period of activity in the machine tool business may be looked for. The iron and steel trade is rather quiet just now due to the difficulty that is being experienced in obtaining material for any purpose other than that required in the production of war equipment. As a result private consumers are handicapped in their manufacturing operations and output is being restricted. The steel mills on the other hand have all the business that they can take care of and are enjoying great prosperity. Prices of steel products are holding firm with the sole exception of galvanized sheets which have declined. Prices of pig-iron are unchanged. In the States the shortage of pig-iron is becoming serious as it is curtailing the output of steel. The situation in the scrap metal market is unchanged. There is a fair demand for iron and steel scrap but copper and other non-ferrous metals are dull. Tin is still very scarce although some relief is looked for in the near future.

MONTREAL, Dec. 3, 1917.—The exceptional success of the Victory Loan has been the outstanding feature of the past week, and this latest indication of the people's optimism promises well for the activity that will be expressed in the distribution of the loan to the many requirements of the Government for the successful prosecution of the war during the next six months. The near approach of the final closing of navigation is demonstrated in the added pressure that is being felt by the various railroads, and already some congestion is being shown in certain directions. Plants that have received orders for 75mm. shell are actively engaged in rearranging their equipment to manufacture this new type, and it is expected that operations will be in full swing early in the New Year.

Pig Iron

The shortage in pig iron is becoming serious in the United States owing to the enormous demands that are made on the furnaces and the heavy requirements of the government; it would not be surprising to see this situation more acute in the very near future. The congestion of the railroads has delayed the delivery of coke and other raw materials with the result that production has been somewhat hampered. The situation here is virtually unchanged with

Steel

With the increasing demands that will [illegible] the war programme, it is anticipated that the domestic situation will become further [illegible]. The progress of steel shipbuilding in Canada has suffered to a large extent by the inability to secure sufficient plate to carry out the work that had been planned in this connection. The increasing activity in this direction in the States makes it additionally difficult for plate consumers here to acquire material for their prospect we needs and this branch of industrial enterprise is feeling the effect of abnormal conditions more than any other. The acute condition at the present time is intensified by the difficulty that the trade is experiencing in the delivery of material owing to the lack of transportation facilities, the railroads being unable to cope with existing requirements.

With the approach of the new year some are looking forward to a revision of the prices that have recently been fixed by the government, but the general opinion seems to be that as the trade is just beginning to adapt itself to the new conditions, it is not thought that any changes now contemplated will seriously affect the quotations that are the ruling factor in general trading. Some consideration may be given to certain details to relieve the pressure in certain directions, but it is not expected that the general tone of the market will undergo any marked change with the coming of the New Year. Dealers here are still governing their operations by developments at Washington, but with the exception that steel shipments are harder to obtain from the States, the situation is unchanged and prices are well maintained; quotations being the same as given last week.

Metals

The general market in respect to metals is unchanged but recent developments have given a new tone to the situation. In an effort to better control the distribution of certain metals, the American Government have placed new restrictions on the importation. To avoid [illegible] of a speculative nature and so insure against the possibility of accumulation [illegible] stocks. The feature of the week is the position of tin, which is still occupying the attention of the trade owing to the marked scarcity that has resulted from the inability to secure shipping permits. Copper is quiet but [illegible] have been reported by small dealers. Spelter is unsettled with [illegible] awaiting government action. Lead is easy and unchanged. Antimony is quiet but stronger. Aluminum is in less demand but firm.

Copper.—With the exception of the slight increase in activity that has developed out of the recent concession of the Government in connection with the 5 per cent. commission allowed to dealers on small transactions, no feature has arisen to change the general tone of the situation, and the market in copper is practically nil, trading being virtually in the hands of the government. Recent regulations are being strictly adhered to, but, outside of the demands that are made for war necessities, producers claim they have very little metal available for domestic consumers. The hope is entertained in some quarters that this condition will be relieved early in the New Year, but apparently nothing has as yet been done that would encourage the trade in this connection.

If war requirements are as large as reported, little relief can be expected by the consumer for some time, but with production proceeding at the present rate, some arrangement will likely be possible whereby the general trade will be more freely supplied with much needed metal. The local market is at present very strong and dealers report a difficulty in obtaining supplies. Quotations are unchanged but the market has a stronger tendency; lake and electro are quoted at 33 and castings at 32 cents per lb.

Tin.—This metal is retaining the center of interest in the metal situation owing to its abnormally strong position due to the pronounced scarcity in the States. The conditions in the United States have become so acute that the Government have commenced to commandeer all available supplies in warehouses, and this action is expected to proceed further. The result, as intended, has been to relieve the immediate need, but the ultimate effect will be to deplete the available supply for future requirements. Unless conditions as they exist at the present time show early signs of improvement, the situation will take on a very serious aspect and one that may well assume alarming proportions. Recent action taken by the American Government to regulate the importation of material, and require a license to this effect, will avoid the possibility of metal being hoarded for speculative purposes.

The American position of tin is very strong, the market being controlled by the highest quotations in the history of the trade. This week's market is one cent higher than that of last week, the current quotation being 81 cents per lb. Dealers here report a very strong market but, owing to considerable stock of metal, the situation has not been marked by the tension that characterizes the American market. Tin here has advanced one cent during the week and can be had for 72 cents per lb., to regular customers of the dealers.

Spelter.—In anticipation of early action being taken by the American Government regarding the fixing of prices, the trade in spelter has been quiet. Both producers and consumers are anxiously awaiting the next step of the regulating committee so as to be in a position to base their future operations on the changes that will be put in force. The present market is a little quiet but continues relatively firm. Local dealers are quoting 10½ cents on a steady but uneventful market.

Lead.—The situation in lead is uncertain and present activity is not pronounced. Consumers are not directly interested in the present situation as many are very well covered for their immediate requirements. Local conditions have taken on a better outlook owing to the developments in shrapnel shell orders, but so far no increase in activity has developed in connection with the sale of lead. Dealers continue to quote 9½ cents per lb.

Antimony.—No increase in the demand has been noted in this metal but considerable interest has been created by the recent action of the American Government in controlling the importation of antimony and kindred alloys by means of the license system. One outcome of this latest move has been the noticeable decline in the offerings, the tendency being to see what the developments will be before disposing of further metal. With the present quotation so close to the actual cost of producing the metal, sellers are taking advantage of every opportunity to put the market on a stronger footing. New York quotations show an advance of ⅜ cents on the week. Dealers here report a firm market with unchanged prices, but an undertone of strength. Current prices are maintained at 17 cents per lb.

Machine Tools and Supplies

Considerable improvement has developed in the machine tool market owing to the impetus that has been given by the renewal of munitions activity, and this is expected to be additionally pronounced in the near future, as prospects for more shell orders are very bright. The volume of inquiry for general equipment is not heavy but of sufficient importance to maintain the interest of dealers. Activity in the States is on the increase and this is making it increasingly difficult to obtain delivery of machinery from American concerns, owing to the urgent requirements for their own government purposes. The recent demand for all classes of supplies has shown an increase of late due to the renewal of activity in munitions manufacture.

Scrap

The market is in an unsettled condition owing to the conflicting reports that are current as to early future prospects. While some anticipate a weaker condition, others look for a stronger market, the natural outcome being an unchanged position for most lines of scrap and old materials. Local prices are firm and unchanged.

Toronto

TORONTO, Ont., Dec. 4.—The remarkable success of the Victory Loan will be gratifying to Canadians as well as to our Allies, not only because it shows a determination to "carry on" with the war, but also by reason of the benefit that will accrue to Canadian industries in the form of orders for war supplies. The munitions industry in particular will benefit by the success of the war loan, as a considerable proportion of the money will be appropriated for the manufacture of shell. Already arrangements have been made to distribute substantial orders for shrapnel, 4.5-inch and 6-inch shell, which will keep many plants actively employed for several months.

Steel

The iron and steel market is somewhat dull, the situation being practically unchanged. Business is on the quiet side owing to the difficulty that is being experienced in obtaining steel for any purpose other than for war equipment and munitions, etc. Judging from the number of inquiries received by local merchants, there is little doubt but that business would be brisk if all the material that is required could be obtained; this applies to imported steel as well as domestic material. The inquiries cover a variety of lines and come for the most part from manufacturers who are suffering from the shortage of steel. Manufacturing operations are being restricted on this account, which is creating a scarcity in a number of articles required for every day use. Manufacturers should place their orders for iron and steel goods required in their business well ahead of time and not allow stocks to become depleted before ordering fresh supplies, by this means avoiding delays in deliveries.

From all accounts the outlook for the steel companies is very favorable, the volume of orders on hand being as large as at any previous time. Production continues on a favorable basis, and a continuation of open weather will help considerably towards this end. Munition orders will continue to be an important factor in the steel trade, and will account for a considerable proportion of the output during the next six months.

Prices of steel products, with few exceptions, are holding firm, there being no changes to announce this week except in galvanized sheets, which have declined about 50c per 100 lbs. It is likely that there will be a further decline in prices of the lighter gauges of black sheets, although they are unchanged in the meantime. In the primary market inquiries for black sheets are heavy and manufacturers are making every effort to take care of their regular customers. Large requirements by the Government have made it necessary for producers to supply only consumers who are engaged in the manufacture of essentials.

Chicago warehouse prices are down, steel bars being now quoted at 4.10c; structural shapes, 4.20c, and plates, 4.45c. The steel market in the United States has been more active in the past week than at any time since prices were fixed, with some increase in private demand in nearly all lines and with many large Government contracts reported. It is believed that the unfilled tonnage statement for November will not show nearly as much of a decrease as the previous one.

Pig Iron

There has been no change in the domestic pig iron market this week, but the situation in the States is becoming more serious owing to the scarcity of fuel and labor. The shortage of fuel at the blast furnaces in the Pittsburgh district continues to be extremely acute and has resulted in an additional number of stacks being banked. The shortage of coke is curtailing the output of pig iron and in turn the production of steel. Steel companies in the United States have been buying low phosphorus iron recently in Canada, and notwithstanding the recent embargo placed on shipments by the Dominion Government, the metal has been released; but hereafter licenses will have to be secured to obtain Canadian material. On the other hand, the United States furnaces are in receipt of heavy inquiries from Canada for basic and Bessemer iron.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.

Scrap

The market for iron and steel scrap is fairly active at unchanged prices, which are holding firm. The supply of these materials is, however, none too heavy, which is keeping the market firm. Prices of copper and other non-ferrous metal scraps are weak and demand light.

Machine Tools

Business in the machine tool trade is gradually becoming more active and the outlook is brighter than it has been for some time. That further shell orders will be placed in Canada is assured by the announcement that the Imperial Munitions Board has received instructions from the British Government to issue contracts for shrapnel, 4.5-inch and 6-inch shell to all Canadian firms equipped to produce these sizes. The volume of these contracts, it is understood, will keep the plants actively engaged until well into the new year. This is all entirely new business, and is, therefore, additional to those contracts now being executed. New equipment will be required in a number of plants to increase production and also to replace worn-out tools. Canadian machine tool builders will benefit by this new business and another spell of activity is assured. Owing to the increasing activity in the United States, deliveries of machinery from across the line are becoming more backward, some classes of equipment being very difficult to obtain.

Supplies

The market for machine shop supplies is steady and prices are holding firm, although there are fewer changes being made now than formerly. A very fair demand is reported by dealers, who are looking for increased business from munition plants.

Metals

There is no material change in the situation in the metal markets and prices generally are holding firm at last week's levels. There is no change in the tin situation although some relief is expected shortly, in which case prices will probably decline. The copper situation is gradually being cleared up although there has recently been some confusion in the trade in the States in regard to jobbers' re-sale prices. The Sub-Committee, Washington, has made suggestions as to the fixed differentials between the various grades of spelter but did not make any suggestions in regard to the base price. The lead market is quiet and unchanged, as is also the antimony market. An improvement in the position of both these metals is looked for when the shrapnel contracts are placed.

Copper.—There is some confusion in the primary market over the resale price for jobbers but the situation is gradually being straightened out. The producers will supply copper after Jan. 1 at the established price of 23½c a pound which may be distributed in small lots to the smaller consumers at 24.675c per pound. The dealers propose to sell copper which they hold and which costs them more than 23½c at an advance over the original cost to them. It is figured that after January the smaller consumers may look for a price which must not exceed 23½c a pound plus 5% commission. About that time it is expected that the high priced copper will have disappeared. The local price is unchanged and market quiet. Lake and electrolytic are quoted at 32c and castings at 31c per pound.

Tin.—An improvement in the tin situation in New York is expected shortly as the Sub-Committee on tin, at Washington, has been given power to control the distribution of tin in the United States and has taken steps to supervise tin importations. The U.S. Navy Department has commandeered all tin in

New York warehouses. The Navy Department action was prompted by the fierce competition for zinc which has resulted in raising the price within a month from 14 cents to 20 cents a pound. The output has sought an open market because of Britain's export restrictions, and it is said that those having government contracts requiring the use of the metal in munitions are starting liberal funds for export to the Allies will be in supply shortly unless some action is promptly taken to remedy the situation. Local price firm and unchanged at 9½c per pound.

Spelter.—The differentials for the U.S. Government prices between prime Western and the grades A and B have been fixed to be delivery of 2c to 3c for brass, 3 for grade B and 5c to 7c for grade A. The base price of the prime of prime Western however has not been established. The market is dull and quotations nominally at 10½c per pound.

Lead.—Prices are unchanged at Friday's close as reliable export news to the market which is active. The position of lead will likely improve with the placing of further shrapnel contracts. Lead is quoted at 8½c per pound.

Antimony.—The market is showing more signs of lift due to heavier buying and the position of antimony has improved. The price is unchanged at 18c per pound.

Aluminum.—The market is firmer and sellers are expecting higher prices. There is no scarcity of metal on the outside market. Quotations are unchanged at 62c per pound.

Sydney

SYDNEY, N.S., Nov. 29.—The Victory Loan campaign closed with great success at the works of the Dominion Iron & Steel Co. A total sum of $420,000 was subscribed by 3,845 workmen. As there are not more than 4,800 workmen at the steel works altogether, and as among these there are included a great many men of alien enemy nationality, the number of subscribers reflects great credit on the rank and file generally, because the total of $420,000 did not include any really large subscriptions.

The contribution of the coal-workers has not been so generous as that of the steelworkers, this being to some extent due to the scattered nature of the collieries and the difficulty of arranging so effective a campaign as was made at the steel works. The Coal Company's men will probably contribute between $280,000 and $300,000 giving a combined total of not less than $700,000, to which has to be added $3,000,000 subscribed by the Dominion Steel Corporation, and credited half to Nova Scotia and half to Montreal.

Mine Workers Seek Further Wages Increase

As was feared the Amalgamated Mine Workers of Nova Scotia have made a demand for a wage increase upon the operators in the Sydney District that is quite impossible of fulfillment. The A. M. W. has asked an increase ranging from a minimum to 30 per cent. to a net total advance on existing rates. A fresh advance on top of the increases given during the past two years is manifestly out of the question, it is probable the failure to agree will result in the appointment of a Conciliation Board.

The coal production of the Dominion Coal Company for November fell to 280,000 tons, the lowest during the war period.

The local tribunals are considering the application of the Dominion Steel Corporation for the exemption of its employees from military service on the ground of the national importance of their occupation in the production and transportation of coal and steel. It is expected that very general exemptions will be granted, as both the steel and coal companies are producing the major portion of their output to the direct order of the Imperial Munitions Board.

The season of navigation just closed has seen the smallest shipment of Nova Scotia coal to the Upper Provinces in the past 25 years. From a pre-war normal shipment of 2,000,000 tons to the St. Lawrence market, the Dominion Coal Co. export this year has fallen to 50,000 tons.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Washington

WASHINGTON, D.C., Dec. 2.—The fact that the Germans destroyed more British ships in the first ten months of unrestricted U-boat warfare than Great Britain or any other nation has ever built in a full year has just been made known. The revelation was made when Chairman Edward N. Hurley, of the United States Shipping Board, made public a letter he had written to Senator Gilbert M. Hitchcock, of Nebraska, on the subject. The Germans have sunk in ten months something over 900 British vessels of more than 3,000,000 tons deadweight.

Chairman Hurley said the greatest shipbuilding feat ever accomplished was that of England in 1913, when 688 vessels of 2,898,229 tons were completed. Japan in 1916, Mr. Hurley said, built forty-three ships of 192,993 tons. This was the biggest tonnage finished by any nation except Great Britain. The American programme, unless held up, will produce 6,000,000 tons by the end of 1918. About 5,000,000 tons will be completed in 1918, thus surpassing Great Britain's best effort by about a million tons.

The United States now has available for trans-Atlantic service 582 ships of a total of 3,721,806 tons, including oil-tankers and former German and Austrian vessels. German and Austrian ships operated by the Shipping Board number 105, of 688,960 tons. American citizens hold eleven more of these ships, totalling 63,915 tons, making the aggregate American holding of enemy vessels 752,875 tons.

New Yard Activities

In reply to questions regarding the activities of new shipyards, Mr. Hurley said all of them that have contracts now have the ground cleared and will have their buildings and ways completed early in 1918. The new yard at Hog Island, Pa., must deliver fifty ships before November 1, 1918, he said, and the Port Newark yard must finish seven in June. The new Bristol Point plant must have four ships ready for service in May.

"Have any British, French, Norwegian, Italian or Dutch authorities yet asserted that they are now building new ships as fast as the submarines are destroying them?" Chairman Hurley was asked. The reply was an emphatic "No." It will be up to the United States, he indicated, to produce new ships faster than the Germans sink them, providing losses are not pulled down by the Allied navies.

A table has been compiled by the Emergency Fleet Corporation showing the vessels under contract and pending contract, and vessels which have been requisitioned by the Fleet Corporation. The figures are: Wood vessels, 375; total deadweight capacity, 1,330,900 tons; composite vessels, 58,207,000 tons; steel, 451 vessels; 3,186,400 tons; total contracted for, 884 vessels; total deadweight capacity, 4,724,300 tons; contracts pending, 99; tonnage, 610,000; total requisitioned (all types), 426; tonnage, 3,029,508 tons. Grand total, 1,409 vessels; total deadweight capacity, 8,363,808 tons. This total includes requisitioned vessels completed and released—33 vessels; 257,575 tons.

Conservation of Coal

Canadian manufacturers will be interested in the news that Canada must place herself upon the same basis as the United States with reference to the conservation of coal. This has been made plain to the Dominion Government by the United States Fuel Administration. In an official communication to the Canadian Fuel Controller, Dr. Harry A. Garfield, Fuel Administrator, pointed out that Canada would be expected to resort to the same measures to save coal as are being adopted in the United States. Dr.

Garfield points out that an intensive campaign is being carried on in this country for fuel economy. It is suggested that Canada conduct a similar campaign for the limitation of the uses of coal and the co-operation of the United States Government in such a campaign is offered. Most of the Canadian coal supply is derived from the United States, and the Fuel Administration has undertaken to give Canada a pro rata share of the United States' supply on the same basis as the various States of the Union. The Fuel Administration, however, demands that Canada safeguard this supply by conservation measures in line with those undertaken in the United States.

The Banking Situation

The daily commerce report of the Department of Commerce publishes a report taken from the London "Statist" of November 3, presenting its customary annual review of the international banking situation, giving, among other data, a statement comprising those banking institutions whose deposits and current accounts exceeded £20,000,000 at the close of 1916. Eighty-four instiutions are listed and in this list are three Canadian institutions. Twenty-fourth on the list is the bank of Montreal with deposits and current accounts of £60,214,000. The Canadian Bank of Commerce is thirty-eighth, with £6,417,000, while the Royal Bank of Canada is forty-fourth, with £40,141,000.

Carbons for electricity may no longer be exported from France to the United States and allied countries without special license. A consular report from Paris says that the permits for such exportation which formerly modified the embargo of December, 1914, affecting these articles has been withdrawn by a ministerial decrease. Special applications must now be made for permission to export these goods to any country.

Navy Dept. Specifications

The Bureau of Supplies and Accounts of the Navy Department has issued notice of proposed purchases of various materials, as follows:

Schedule 1581, motor generators for various navy yards; schedule 1572, fifteen navigational, sounding, motor driven machines for the Brooklyn yard; schedule 1580 six portable ventilating sets for Portsmouth yard; schedule 1582, five lathes, engine, high-duty, universal, 12-inch, 5-foot bed, for the Annapolis naval academy.

The Bureau of Supplies and Accounts, the Navy's purchasing organization, has evidence that at least one commodity has been deliberately held for abnormally high prices. In the case of tin, the navy has commandeered 1,000 tons stowed in New York warehouse, but has turned over to the American Steel and Iron Institute the question of further adjustment of prices and supply. The navy had sufficient tin, through foresighted purchases last spring, to supply its own needs, but there was a prospect that if more tin were not given contractors, the navy destroyer program would actually be halted for want of machinery in which tin was used directly or as an alloy. One New York concern—a Dutch house—had a big supply of tin, from which the navy drew 800 tons. The manager, manifestly, was holding for high prices, for he did not even know what to charge when asked for a quotation. He informed the department he would have to consult his home office. This waiting on high prices was undertaken in the face of the fact that Holland would have no market here if the British had not permitted her to ship the goods in. Tools intended for South America have been seized because of the pressing need for them here.

The United States Tariff Commission anounce that it will hold hearings in the near future for the purpose of receiving information and suggestions from representatives of industry and commerce and labor and foreign trade on war disturbances and the plans for readjustment to peace times, which are being considered.

President Wilson has issued a proclamation under the authority of an act of Congress of October 6, 1917, forbidding the importation into the United States or its territorial possessions, from Great Britain, her colonies, possessions and protectorates, and from a long list of other countries, of various commodities, except under license granted by the War Trade Board in accordance with the regulations. The list of commodities includes vanadium, vanadium ore, nickel and nickel ore, chrome and chrome ore, titanium and titanium ore, etc., or any ferro-alloy or chemical extracted therefrom.

New York

NEW YORK, Dec. 1. — The United States Government is obligated to pay $3,000,000 for merchant ships, ordnance and ammunition. A little more than one half of this amount is for big guns and projectiles and a little less than half is for cargo boats. The official report of the United States Shipping Board issued last Monday shows that the Emergency Fleet Corporation has entered into contracts for 1,310 boats of various tonnages for which it will pay approximately $1,360,000,000 and contracts for 99 additional boats of an aggregate capacity of 610,000 tons are under negotiations which when placed will make the total obligations of the corporation $1,465,000,000 including the ships commandeered as well as those to be built and those already under construction or delivered.

Shipbuilding Steel Requirements

The building of the 1,409 boats, including 33 ships already completed and released, will require almost 2,300,000 tons of steel plates and shapes. The Navy Dep't is also building or having built battleships, cruisers, torpedo boat destroyers and other war craft that will require 450,000 tons of plates and shapes, or a grand total of 2,750,000 tons of steel to carry out the full program of the Shipping Board.

The 451 ships of steel construction of 3,186,400 tons deadweight will require 1,062,000 tons of steel, and the 426 ships of 3,029,508 tons capacity requisitioned require 1,009,508 tons of steel to build. The composite and wooden ships that are under contract require scarcely more than 25,000 tons of steel. Since the report, some of the 99 ships under negotiation have been placed under contract. These 99 boats will require 204,000 tons of steel.

The Submarine Boat Co. has taken additional orders from the government for 100 five thousand ton ships, making a total of 150 cargo boats to be built at Port Newark. The United States Steel Corp. has appropriated approximately $18,000,000 for its Southern subsidiary plants, half of which will be used in the construction of the Chickasaw Shipbuilding plant at Mobile and the other $9,000,000 will be expended for extensions to and the equipment of the Ensley plant of the Tennessee Coal, Iron & Railroad Co., made necessary to roll plates and shapes for the ships to be constructed at Mobile. It is estimated that about 10,000 tons of structural steel will be required for shipways, power plant, boiler, machine, metal, joinery and forge shops as well as for storehouses and office buildings at Mobile. Extensions at the Ensley plant will require between 8,000 and 10,000 tons of shapes.

The Steel Corporation originally appropriated only $6,000,000 for the Federal Shipbuilding plant in the Hackensack Meadows, but an additional $2,000,000 was appropriated about ten days ago and probably several more millions will be called for before construction and equipment there are completed.

Munitions Orders and Expenditures

The U.S. Ordnance Bureau has distributed additional orders for 1,250,000 shells which will require approximately 106,000 tons of steel rounds and forgings. The American Brake Shoe & Foundy Co. will manufacture 750,000 155 mm. shells and Westinghouse Electric & Manufacturing Co. and the McMyler-Interstate Co., of Cleveland, will manufacture 500,000 200 mm. shells. The Bureau is now distributing orders, also, for the machining of 900,000 240 mm. projectiles. It is understood that a large proportion of this business will go to the American Car & Foundry Co. and to the American Brake Shoe & Foundry Co.

Contracts for the forging of 2,150,000 shells have already been allotted among twelve steel companies and forge shops. Since the U.S. entered the war, it is estimated that the Ordnance Department has awarded contracts for 60,000,000 shells of various sizes and it is expected that contracts for 30,000,000 additional shells will be placed as soon as manufacturing capacity is prepared to execute the work for the Government. The War Industries Board has allotted orders for 50,000 tons of steel plates in-

[illegible] tons of steel sheets [illegible] tons are for export to France and Italy. Railroad equipment shops have also placed orders for [illegible] tons of steel for the construction of cars and locomotives for U.S. roads.

Pittsburgh

PITTSBURGH, Pa., Dec. 1.—The finished steel market has become extremely active in the South and Middle West during October. There has been a larger volume of specifications against old contracts and somewhat more new buying. The new buying is as a rule limited by the ability of mills to make early deliveries. Some of them can take on no new business at all while some can take on more than limited tonnages.

Sheets Active

Easily the most active branch of the general finished steel trade has been the sheet market. It is estimated that the independent mills booked about 140,000 tons, in blue annealed, black and galvanized. Of this perhaps one-fourth was Government business, although no specific figures are obtainable. The bookings were about one-half greater than a month's output, deliveries running all the way from prompt to first half 1918. In all cases, so far as can be learned, the Government prices prevailed, on the basis of 4.25c for blue annealed, 5c for black and 6.25c for galvanized. The Government prices, however, do not necessarily apply to exports for peace purposes. Next in point of activity has been wire products. Activity in these lines was due chiefly to the simple circumstance that mills were less sold up, and buyers less well covered, than was the case with most other products, particularly the heavy rolled steel materials.

Market Tone Improved

There has been a further improvement in the general tone of the market. This doubtless arises in large part from the better financial situation and outlook, which is improved although not perfect. Some close observers date the inception of the improvement from the time Secretary McAdoo made his statement, early in November, that the Government's war expenditures would be much less than had been reported, or say about ten billion for the fiscal year. Some of the stiffening, however, is attributable to the further curtailment in iron and steel production that has occurred in the past three weeks, due to shortage of coke and coal, this being almost entirely a reflection of the traffic congestion, particularly in the Pittsburgh district.

Pig Iron Unobtainable

Except for occasional odd lots of foundry iron which furnaces consent to sell to needy and regular customers, no pig iron can be bought in this district. Reports from the east show a fairly large volume of business, and evidently the eastern districts are not suffering from coke shortage as much as the Pittsburgh and valley districts, and the Chicago district. The majority of merchant furnaces have been losing production, having to bank for longer or shorter periods on account of not receiving sufficient coke. One Shenango valley interest, with three stacks, had to bank two of them this morning. The steel works are suffering as much, as to their blast furnaces, as the merchant stacks. The Carnegie Steel Co. has been operating only 48 of its 59 blast furnaces, this being due entirely to traffic congestion, as it makes all its coke itself.

W. P. Snyder & Company, who compute monthly the average price obtained for Bessemer and basic iron at valley furnaces, including all sales of 1,000 tons or over, report November averages at $36.30 for Bessemer and $33 for basic, these being the set prices, and the same averages obtained for October, but while the total tonnage used in the October computations was about 100,000 tons, the November computations included only a very small tonnage.

Government Buying

The Government continues to allot large tonnages of steel, but details are withheld. The placing of shell steel business continues and additional allotments are being made of ship steel. A significant item is that while no public announcement has been forthcoming, the steel trade learns that a fresh canvass has been made of the plate situation, to determine the feasibility of placing orders for freight cars to relieve the railroads. It has been found that on account of the large increases in plate rolling capacity due to new construction, it will be possible to take care of the shipbuilding programme as being speeded up further, and still leave a considerable tonnage of plates for steel car building. It seems to be the intention to place some large orders, first for locomotives and then for cars, on behalf of the domestic roads, the filling of the orders to be speeded up under the Government's priority authority. The Russian situation makes it necessary to defer the filling of orders tentatively placed for Russian account, and this releases some locomotive and car-building capacity.

The Railroad Pool

Of much more immediate importance than the prospective placing of equipment orders for early delivery to the railroads is the agreement reached one week ago to-day to pool all the railroads east of Chicago. The operation of the pool is placed in the hands of seven railroad officials, known as the General Operating Committee of the Eastern Railroads. The committee reached Pittsburgh on Tuesday and opened offices in three rooms in the Union Arcade (where these letters are written). Wednesday it issued half a dozen orders to the railroads of sweeping significance. Next day, Thanksgiving Day, it kept at work. Friday it moved into larger quarters, ten rooms, and to-day, Saturday, it worked to 7.30 p.m., to resume work Sunday morning at 10 o'clock.

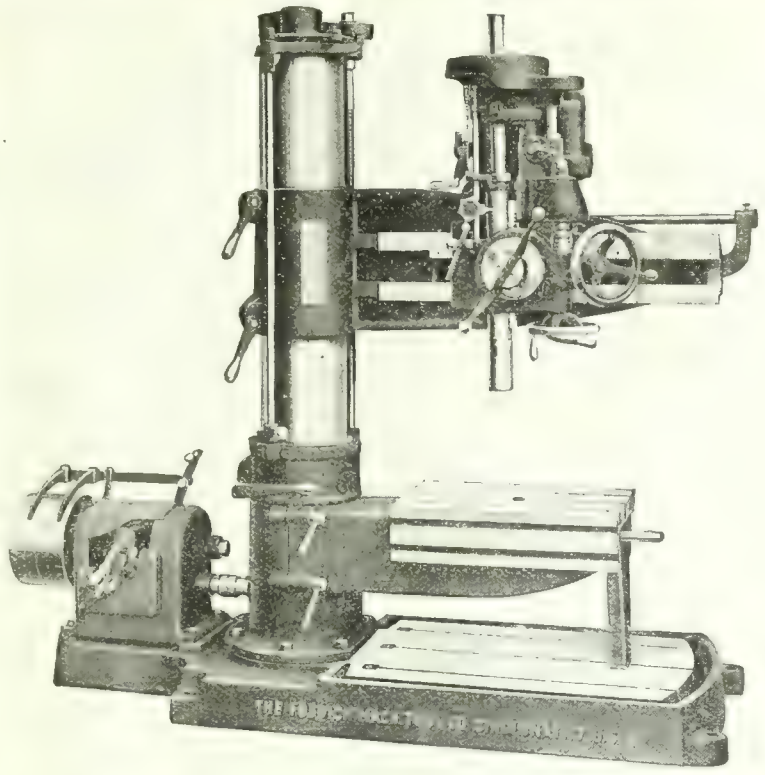
The early orders issued were directed chiefly to clearing the congestion in the Pittsburgh district, all through traffic east and west being embargoed and ordered to proceed by lines north or south of Pittsburgh. The Pennsylvania's "Broadway Limited," the crack 20-hour train between New York and Chicago, was ordered discontinued. The "Fast Freight" lines were ordered discontinued and put on regular freight schedules. Various other measures were taken.

These strenuous measures taken to relieve the situation in the "Pittsburgh gateway" may result in congestion elsewhere, but the significant thing is that it has been the congestion in the Pittsburgh district that has been the chief factor in curtailing iron and steel production below the physical capacity of furnaces and mills. The coke shortage has been almost entirely of Connellsville coke, and the major part of the Connellsville coke production should pass to or through the Pittsburgh district. As to coal shortage, this has been felt chiefly by steel mills in the Youngstown district, and most of the coal for those mills must pass through the Pittsburgh district.

Presumably the measures being taken by the General Operating Committee will have important results, and if there are results they will be chiefly by way of the congestion in the Pittsburgh district being relieved, and larger production of pig iron and steel should result very shortly.

EXPORTING TO THE ORIENT

THE Manitoba Rolling Mills Co., Winnipeg, recently secured a large order from the Orient for iron and steel bars. This is required for repair and upkeep of railway equipment, as well as in shipyards and engineering trades of China and Japan. This is the start of what will probably develop into a large export business between Western Canada and the Orient. The Manitoba Rolling Mill Co. have only been operating for the last eighteen months, and during that time their output has increased until to-day it approximates 2,000 tons per month of finished product. This company is rolling high quality bar iron and steel, rolling the steel from new electric steel billets. They are supplying considerable tonnage to be used in connection with wooden shipbuilding in Canada, for the upkeep of railway rolling equipment and engineering trades, as well as for use in the manufacture of agricultural implements. They have also disposed of large tonnages of reinforcing steel used in the construction of grain elevators and general building work. Further tonnages are shipped through wholesale hardware and blacksmith supply jobbers for general farm and blacksmith purposes.



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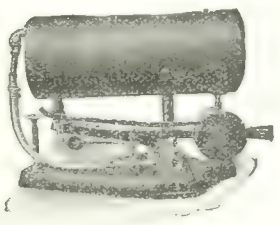

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Copper Cliff, Ont.—The Canadian [illegible] for the erection of a [illegible] at this place.

Amherst, N.S.—The International Fo[illegible] Co. contemplate the erection of a $[illegible] addition to their present [illegible].

Arnprior, Ont.—It is reported that [illegible] Hope, of Renfrew, contemplate establishing an industry here in the spring.

St. Anthony, Nfld.—The Arctic ship owned by Eagle Molasses was completely destroyed by fire with a loss of $[illegible].

Toronto.—The Cluff Ammunition Co. [illegible] to build a steel store house at 27 Atlantic avenue, to cost $20,000.

Toronto, Ont.—The Dunlop Tire and [illegible] Co. have been granted a permit to build an addition to the power house on Eastern Ave., to cost $5,500.

St. Mary's, Ont.—W. W. Parker, Detroit, is [illegible] for a site at St. Mary's where he proposes to build a plant for the manufacture of farm tractors.

Strathroy, Ont.—The St. Andrew's Wire Works of Canada, Ltd., has secured a building at Strathroy, Ont., which it will remodel and equip for the manufacture of wire products, etc. G. M. Harding is [illegible] manager.

Brantford.—Fire destroyed the brass foundry of Charles Lake, 46 West Street, at an early hour on November 30. The cause of the fire is unknown. The foundry, a frame and brick building, was burned to the ground.

Paris, Ont.—A bad fire occurred at the McFarlane Engineering Works here on Nov. 27, when damage to the amount of $5,000 was done. A large building was nearly destroyed, besides a considerable amount of machinery, electric motor, etc., being damaged.

Niagara Falls, Ont.—The building at Niagara Falls, jointly occupied by the Davis-Bournonville Co. and the Davis Acetylene Co., has been taken over by the former company and will be operated exclusively for the manufacture of oxy-acetylene apparatus for the Canadian trade.

Trenton, Ont.—An explosion at the British Chemical Co. plant here did considerable damage last Friday. The explosion occurred in a small separate building known as the "solvent recovery" department. What the cause was has not yet been ascertained, but it was [illegible] forming an explosive compound.

Cobalt, Ont.—It is understood that plans are now under way for the development of electric power at Big Bend Falls to supply Gowganda and the new district of Matchewan. The Big Bend Falls are capable of developing between 5,000 and 6,000 horse-power, which would undoubtedly supply all the power that Gowganda will require for several years and take care of any mines developing in the Matchewan district.

Brockville, Ont.—The chief engineer of the Ontario Hydro-Electric Commission has informed the local utilities commission that Brockville will soon be linked up with the Ontario systems through the transmission of 10,000 horse power from the Cedar Rapids Transmission Co., which at present is developing and supplying from sixty thousand to eighty thousand horse power to aluminum and other works at Massena, N.Y.

Port Arthur, Ont.—It was announced recently that the property of the Conley Frog & Switch Works, Port Arthur, has been sold to the Terminal Land Co. This was the property on which the Conley company commenced the construction of a factory before the war and later ceased operations pending less troubled times. J. R. Smith, president of the Terminal Land Co., stated that important developments are planned on this property. It is understood Mr. Smith has acquired certain machinery with which he intends to equip the plant.

Niagara Falls, Ont.—Excellent progress is now being made on the Chippawa Hydro-electric Power Canal, and the preliminary work has got well under way. The construction railway which will carry away the material excavated has been completed from the Whirlpool to the power-house, and the rest of the line is being pushed forward. At the present time operations are being centred on the erection of a concrete bridge for the Niagara, St. Catharines & Toronto Railway tracks at Stamford. This is only one of about thirty bridges which will have to be built. The engineers are filling in a great many ravines around the Niagara River with the earth taken out in excavating the canal.

GENERAL

Quebec, Que.—The J. B. Drolet Co. will build a factory here to cost $20,000.

Orillia.—Fire on Nov. 25 destroyed the Carss Mackinaw Co's. factory, the total loss being estimated at $40,000.

Montreal, Que.—The A. R. Whittall Can Co. will build an extension to their factory at a cost of $25,000.

Port Arthur, Ont.—The Saskatchewan Co-operative Elevator Co. will construct a new elevator on the Port Arthur north and waterfront at a cost of $450,000. It is to be ready to handle the crop of 1918. The unloading capacity will be twelve cars per hour and shipping capacity to the boats 45,000 bushels per hour. The Canadian Northern Elevator "B" will be rebuilt during the winter at a cost of $500,000.

MUNICIPAL

Lethbridge, Alta. The City Council contemplate the installation of power plant equipment costing $63,000.

Sarnia, Ont.—The Sarnia Gas Co. is notifying all industrial users that the supply will be shut off on December 15. The supply from the Tilbury and Dover fields is rapidly diminishing, and before long citizens as well as manufacturers may have to revert to coal and wood. The coal situation here at present is not encouraging.

Toronto.—Tenders, addressed to the Secretary-Treasurer, Board of Education, will be received until December 13, for all trades in the erection of a new 12-room school building, annex, at Queen Alexandra public school. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, 155 College Street.

Montreal, Que.—The Board of Control has resolved to cancel the contract awarded to the Cook Construction Co., in July, 1913, for the enlargement of the city aqueduct at a cost of $2,232,000. The work is less than one-half completed. Both parties agreed to arbitrate their claims and counter-claims which, as originally submitted, amounted to one million and three quarters on each side.

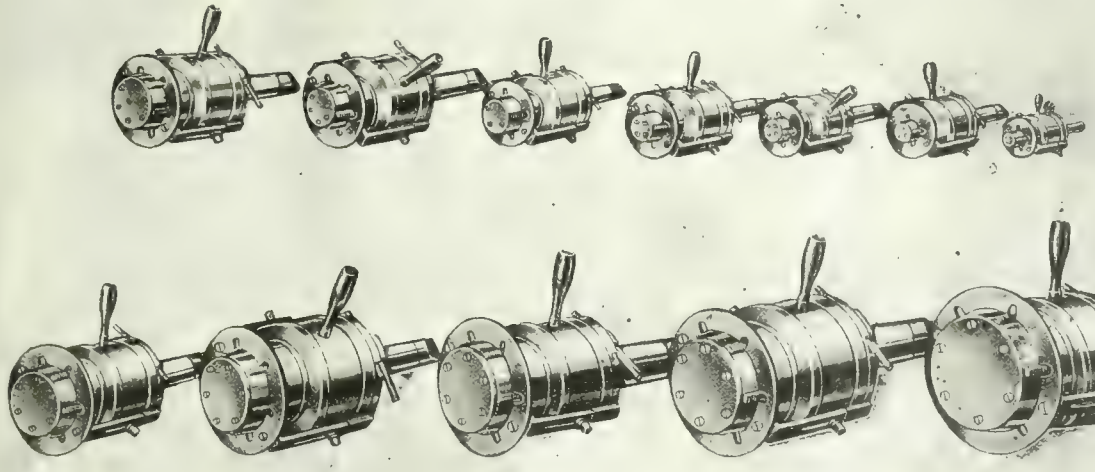
Toronto, Ont.—President S. A. Armstrong, of the Canadian Nu-Fuel Co., has submitted proposals to the Board of Control for utilizing the city garbage and refuse in the manufacture of fuel and other products. One proposal is that the city operate its own plant on a royalty basis and the other is to have the plant operated by the company, the city to furnish the garbage and other concessions to be the subject of an agreement. It was explained that cans and iron would be taken care of by a melting furnace, rags and cloth would be sterilized in an automatic laundry, all bottles would be washed and sterilized, broken glass will be ground and sold back to the glass manufacturers, grease would be extracted from free garbage, and the balance of the garbage manufactured into Oakoal.

PERSONAL

B. J. Lanigan, secretary-treasurer of the Calgary Iron Works, was married recently to Miss Winnifred Colgan.

Captain George L. Magann, son of George P. Magann, railway supplies contractor, who resides on Dowling avenue, Toronto, has been wounded. He was

GEOMETRIC TAPS



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A micrometer scale adjusts them for a tight or loose thread. Because of the adjustable feature, Geometric Taps always produce accurate threads, no matter how often the chasers have been ground.

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WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

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Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

Limited, as effect in the 12th Battery, of which Col. Leonard of London was the officer commanding.

Walter C. Teagle, of Toronto, president of the Imperial Oil Co., has been elected president of the Standard Oil Co. Mr. Teagle was born in Cleveland, Ohio, in 1878. He was appointed president of the Imperial Oil Co. in 1913, and president of the International Petroleum Co. in 1915.

Flight-Lieut. Lloyd M. Archibald, Royal Flying Corps, No. 100 Squadron, France, is now a prisoner of war in Germany. He was formerly reported missing since Oct. 24. He went overseas in October, 1916, completing his training with the R. F. C. in England. For a time he was a night pilot, patrolling the North Sea, and about the 1st of October this year left for France, where he was a pilot, bombing at night. He is twenty-four years old, was born in Nova Scotia, but was educated in Toronto, and before enlisting was a coast to coast traveller with the Dart Union Co., Toronto.

TRADE GOSSIP

McLain System, Inc., 906 Goldsmith Building, Milwaukee, Wis., has changed its name to the McLain-Carter Furnace Co. Oil fired open-hearth and metal melting furnaces will be the company's specialties.

British Magneto Output.—Although before the outbreak of the war the output of British magnetos was not more than 100 a week, since the war no fewer than 165,000 magnetos are said to have been produced in Great Britain.

Tungsten Situation Unchanged.—Conditions in the tungsten market are not materially altered. Europe continues to be a buyer in the South American market, and is offering high prices. Wolframite ranges between $23 to $26 as to grade. Scheelite continues firm at $26.

Foss Machinery and Supply Co.—The firm of Foss & Hill Machinery Co., of Montreal, has been dissolved. Geo. F. Foss has bought out the interests of Mr. Hill who has been associated with the firm for the past 12 years. The new company will be known as the Foss Machinery & Supply Co.

The Calgary Iron Works, Calgary, have completed a contract for shells and are now engaged upon the production of parts for the "Bull" tractors. These parts include wheels, gears, pinions, pistons, etc., such as are used on the larger sizes of oil, gas and steam tractors.

To Fix Price of Silver.—Negotiations are proceeding in London between Great Britain and the United States with a view to fixing the price of silver for the year, according to Andrew Bonar Law, Chancellor of the Exchequer, who made an announcement to this effect in the House of Commons recently. He said he thought it possible an agreement would be reached.

Dominion Customs Revenue.—Customs receipts for the eight months of the fiscal year closing Nov. 30 aggregate $115,324,907, as compared with $94,728,997 for the corresponding period last year, an increase of $20,595,909. For November alone receipts were $12,949,614, an increase of $746,092, as compared with November, 1916.

New Metal From Nelson, B.C.—A Scottish scientist has discovered a new metal which is believed to belong to the platinum group. It is called by him canadium. He has obtained a few grams per ton in the pure state by treatment of certain rocks found in Nelson, B.C. There is some anticipation that the new metal will find industrial uses, especially by jewelers.

Blanket Insurance Expired.—On Dec. 2 at midnight all marine insurance of the blanket nature became void, but many companies continue to insure their boats by the trip. Many companies carry their own insurance, and these may operate until the ice closes the locks at the Soo. Vessel men, made optimistic by the unusually mild weather, are hoping for one or more round trips yet. The majority, however, of the small boats are now in winter quarters.

Two Vessels Launched at Polson's.—Two steel fishery protection vessels were launched at the Polson Iron Works, Toronto, on November 27. Although no invitations were issued, a large number of persons were present to witness the ceremony, which took place without any mishap. The engines and boilers are ready to be fitted up immediately, and it is anticipated the boats will be able to pass down the St. Lawrence before navigation closes. The vessels were not named, but are numbered T.R. 15 and T.R. 16 respectively.

New Zealand Wants Quicksilver.—The New Zealand Government has offered a bonus of 8 cents per pound for the first 100,000 pounds of retorted quicksilver that the mines of New Zealand produce, under the condition that at least one half of the quantity is produced on or before March 31, 1920, and the remaining half before March 31, 1921. It is reported that there are several rich deposits in the Dominion of Canada, but that little has been done as yet for lack of sufficient capital.

Freight Service Over Quebec Bridge.—The service of the car ferry steamer Leonard between Quebec and Levis was suspended on Monday, and freight cars will run over the Quebec bridge, which will greatly expedite shipments. It is stated that the steamer Leonard may be sold for service in the Straits of Canso. It is also announced that within two weeks passenger trains will be running over the bridge, and Canadian Government railroad schedules from Montreal eastward will be changed in consequence.

Economy in Tin-Plate.—Manufacturers of food products are warned by the Food Controller for Canada that the use of tin-plate must be curtailed in every possible way. So serious is the situation that the United States has prohibited exportation, except under license. No export licenses will be granted for uses other than for the manufacture of food-

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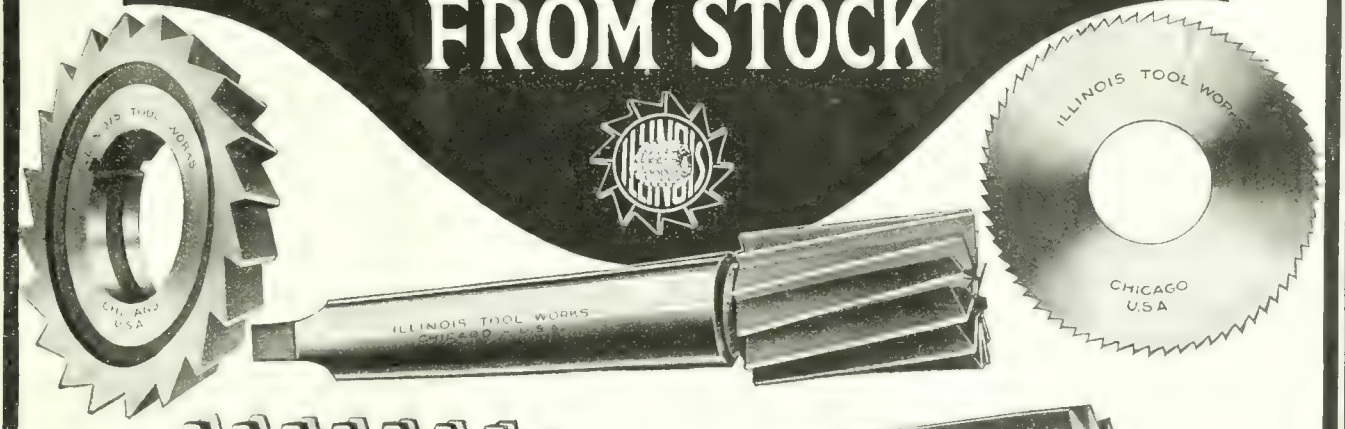

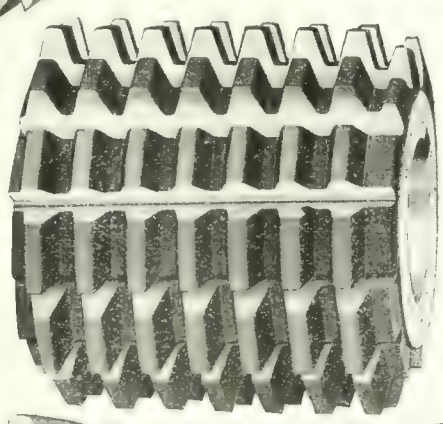

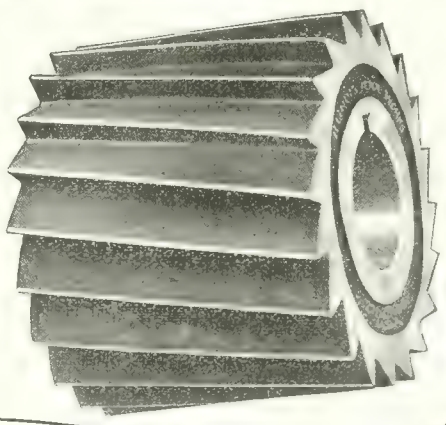

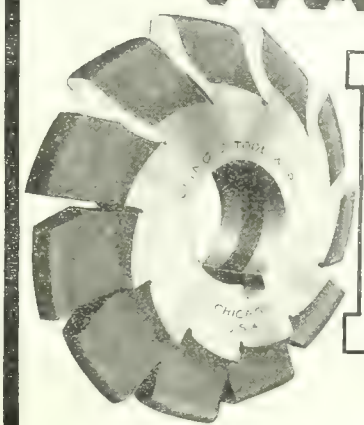

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[illegible] steamers, except on satisfactory evidence that the plate will be used in such a way as to fill the military needs of the Allies. Preference will be given to applications that have to do with war food contracts.

Stainless Steel Making Stopped. In view of the difficulties in getting supplies of ferrochrome in Great Britain, the manufacture of stainless steel for cutlery purposes has been prohibited by a regulation recently issued to manufacturers, according to U. S. Consul John M. Savage at Sheffield, England. The regulation goes on to state that ferrochrome must only be used in connection with high speed crucible carbon steel and alloy steel and in the case of the latter only where a priority certificate or other permit number has been obtained which will warrant the manufacture of the steel in question.

New Concern Develops Hematite Mines.—The prevailing high prices of hematite iron ore of good quality has stimulated this class of mining in Ontario and Quebec. One of the companies recently incorporated in Canada is the Canadian Union Iron Mines Corporation, Montreal, with a capital stock of $1,000,000, which intends opening deposits near Sutton, Que., where hematite iron ore has been uncovered analyzing 68 per cent. metallic iron. This company has already commenced operations at another mine near Perth, Ont., from which, it is said, there were several thousand tons of iron ore taken a few years ago.

Urges Survey of Power in Canada.—At the Dominion Conservation Commission annual meeting in Ottawa on Nov. 28, A. B. White, C.E., read a paper urging that nothing be done to alienate power rights on the St. Lawrence River until a comprehensive survey had been made. Sir John Kennedy, consulting engineer of the Montreal Harbor Commission, believed that a scheme of development should be agreed upon by an engineering commission and then handed over to a joint commission, such as the International Waterways Commission. He favored Government development. R. A. Ross, a Hydro-Electric engineer, from Montreal, agreed, and also advocated a scientific survey of the whole of Canada's power and undeveloped energy.

Lake Steamers for Overseas Trade.—An important part of the work of the Department of Marine and Fisheries at present is concerned with the transfer of steamers formerly employed in trading on the Great Lakes to the overseas trade. Some of the larger lake steamers had to be taken through the canals in two sections. It was announced recently by an official of the department that ten steamers hitherto employed in trading on the lakes have already gone or are going to the overseas trade. One steamer, of full canal size, built at the Polson Iron Works, Toronto, for Norwegian interests, is going out in a few days and another large steamer, built by the Thor Iron Works, also of Toronto, has been sold to France, and will be ready for ocean service shortly.

To Cut Down Non-Essential Trades in U. S.—The United States Government's first move toward curtailing non-essential industries during the war was made on Sunday when the fuel administration sent to coal producers a preferred list of consumers to serve as a guide in filling orders. The list establishes preferential shipment for Government orders of railway fuel, household requirements, public utilities, steel plants, coke ovens and munition plants. Facing a coal shortage of fifty million tons for the country, the fuel administration is determined that a radical step was necessary if essential industries and public utilities were to be kept running. It turned down suggestions that a list of non-essential industries and public utilities where coal should be denied and established instead the preferential list as less likely to injure the banking credit of concerns which it is considered certain will suffer.

TENDERS

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to January 15, 1918, for the construction of a drainage system (wrought iron pipe) for the Don Bridge, Bloor Street Viaduct. Specifications and forms of tender may be obtained upon application at the Bloor Street Viaduct Field Office, 89 Castle Frank Road.

Ottawa, Ont.—Tenders will be received until December 17 for the electric conduits, outlets and fittings required in the reconstruction of the Parliament Building. All tenders to be based on the supplying and delivering on the site of the quantities of the schedule of material for electric conduit, outlets and fittings, in strict conformity with the specifications and the samples submitted and to the satisfaction of the architect. Deliveries to commence so far as possible immediately after the signing of contract and to continue as directed in such quantities as to ensure complete delivery by March 1, 1918. The schedule of material, specification and any other information required can be obtained at the office of the P. Lyall & Sons Construction Co., Ottawa.

CONTRACTS

Brantford, Ont.—The Roelofson Elevator Co., of Galt, have been awarded the contract for a freight elevator by the Kitchen Overall & Shirt Co. of this city.

Toronto.—The Board of Education has awarded a contract to the Johnson Temperature Regulating Co., Toronto, for heat regulators at Perth Avenue school annex.

Toronto, Ont.—The Dominion Sewer Pipe Co., of Swansea, has been awarded, by the Board of Control, the contract for the ensuing year's supply of sewer pipe. The National Iron Works will supply the cast iron pipe.

Toronto, Ont.—The Hanover Portland Cement Co. has been awarded, by the Board of Control, the contract for sup-

plying the city with cement next year. Their tender was $2.45 a bag, with a discount of five cents a bag for prompt payment.

MARINE

Montreal. — The 7,000-ton steamer Porsanger, the largest ocean going vessel constructed in Canada, and built for a Norwegian concern, was launched from the shipbuilding slip of the Canadian Vickers Ltd., last Thursday.

Esquimalt, B.C.—The Victoria Whaling Co.'s steamer Gray, which has been on the ways of Yarrows, Ltd., Esquimalt, for the past three weeks, was placed in commission on Nov. 22, and will at once be placed in service for a cruise to the West Coast whaling stations. The damage which the Gray sustained when it ran on the reef at Cape Calvert about a month ago has been completely repaired, and the job took practically a week less than was at first expected.

BUILDINGS

Toronto. — Tenders recently received by the Board of Education for the construction of Perth Avenue school annex amounted to $92,432 as compared with an estimate of $55,000. Tenders will be called again for the ornamental ironwork as only one firm submitted a bid.

Toronto, Ont.—It is understood that the T. Eaton Co. will not proceed with the work in connection with the proposed store at the corner of Yonge and College Streets. It is said that the contract with the Dominion Bridge Co. for the steel work has been cancelled.

INCORPORATIONS

Laval Chemical Co. has been incorporated at Ottawa by C. F. Laurion, J. C. V. Roy and J. A. Guy to manufacture chemicals, alcohol, soap, etc. The company is capitalized at $100,000 and the head office is at Montreal.

Ottawa Paper Box Co. has been incorporated at Ottawa with a capital of $150,000 to manufacture pulp products, boxes, etc., at Ottawa, the incorporators are A. C. Fleming, W. S. Mackenzie and J. E. McVeigh, all of Ottawa.

Eagle Smelting & Refining Works, Ltd., have been incorporated at Ottawa by Peter Bercovitch, E. Lafontaine and N. Gordon, all of Montreal, to manufacture, smelt, refine babbitt, solder, brass, lead and zinc etc. The company is capitalized at $40,000 and the head office is in Montreal.

CATALOGUES

Bennis Machine Stoker is the title of a catalogue, on cheap steam and machine firing, issued by Ed. Bennis & Co., Little Hulton, Bolton, England. The introduction to the catalogue deals with cheap steam and smokeless chimney followed by a description covering the construction and operation of the "Bennis" patent machine stoker fitted with patent pneumatic gear and self clearing compressed air furnace. Views

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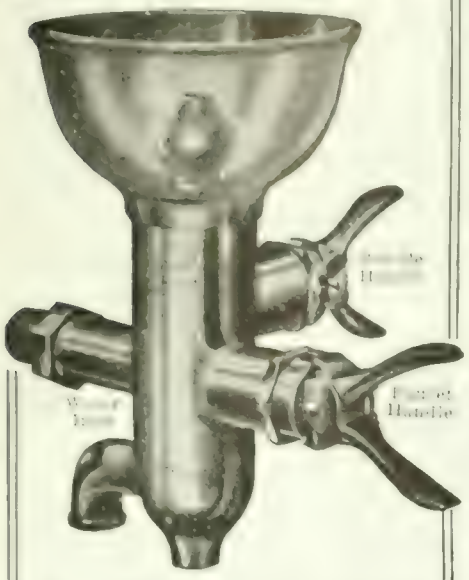

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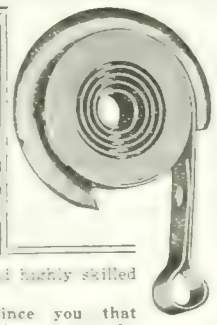

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and drawn of the various parts, and also of installations. The application of the Bennis stoker to many various types of boiler is shown by means of reproductions from actual drawings which show the general arrangement of the stoker and furnace in each case. The catalogue also contains reports of two boiler tests with Bennis machine stockers installed.

Air Squeezers.—Bulletin distributed by The Berkshire Mfg. Co., Cleveland, Ohio, illustrates and describes the Berkshire air squeezer operated by hand or power. The machine is illustrated in various operating positions. The Berkshire vibrators, flask fittings and power rotary riddle are also mentioned in this bulletin.

Air Washer.—The Carrier Air Conditioning Co. of America, Buffalo, N.Y., has issued a folder entitled "Look Inside for Details" which is so made that it shows the actual construction both inside and outside of the carrier air washer. The folder also states the principal features of this air washer.

Ratchets and Wrenches.—The Keystone Mfg. Co., Buffalo, N.Y., have issued a catalogue and price list No. 25 dealing with an interesting line of ratchet drills, socket wrenches, tap wrenches and stud drivers, adjustable wrenches, taper sleeves, steel sockets, drilling posts, etc. The catalogue is fully illustrated.

Tumblers and Dust Arresters is the title of a new catalogue No. 132 issued by the Whiting Foundry Equipment Co., Harvey, Ill. The catalogue contains a detailed description covering the construction of one class of tumbler and briefly refers to other types. Dry and water cinder mills and dust arresters are also mentioned at some length. The catalogue is fully illustrated and contains tables of dimensions covering the products described.

BOOK REVIEW

Motor, Marine and Aircraft Red Book, 1917.—439 pages and numerous illustrations. Published by the Technical Publishing Co., London, England. Price 5/6, ($1.40). This is the seventh edition of a year book published under a new name more in keeping with its extended field. This volume contains an abundance of information pertaining to motor cars and their manufacturers, motor cycles, commercial and agricultural motors, marine motors, aircraft, etc., together with full information relating to the legislation necessitated by the war as affecting motor, aircraft and allied industries. The information has been collected and made easily accessible concerning internal combustion engines, steam engines and electric motors. Special attention has also been paid to the use of motors in agriculture and horticulture, and in the municipal and public services. The book contains nine sections and a dictionary of technical terms in five languages, the latter being introduced to further the interests of the export trade. It is not possible to give particulars of all important information contained in this volume which will prove of very great value to those interested in the motor industry and trade.

B.C. SPRUCE FOR AIRPLANES

The survey of the forest resources of British Columbia, upon which the Commission of Conservation has been engaged for the past four years, has proved of striking immediate value in the prosecution of the war. The Imperial Munitions Board, which has definitely taken in hand the organization of airplane manufacture, found itself in immediate need of large quantities of airplane spruce, and the Commission was able, as a result of its survey, to furnish the board with specific information as to the location and ownership of all the large bodies of spruce in British Columbia suitable for that purpose. The fact that this information had previously been collected enabled the Munitions Board to take up without delay the matter of securing the necessary supplies of this vitally important material.

Steps are being taken to increase the production of airplane spruce beyond all limits previously thought possible.

This is but another example of the vital importance of Canada's natural resources in winning the war. Many experts hold that the best prospect for definitely and overwhelmingly maintaining the supremacy of the allies is in connection with the war in the air. This involves the manufacture of many thousands of airplanes, toward which the most intense efforts of the Allies are being directed. The most suitable species of wood for this purpose is Sitka or silver spruce, of which great quantities are to be found on the Pacific coast of North America. Canada's share of this timber is very large, and is considered so important in the prosecution of the war that its export, except under license, has recently been prohibited by the Government to all destinations abroad other than the United Kingdom, British possessions and protectorates.

MINERAL CONSERVATION ADVOCATED

AT the annual meeting of the Dominion Commission of Conservation held in Ottawa last week Sir Clifford Sifton stated that: "No serious attempt has been made to grapple with the problem of preventing the serious and irreparable waste which is constantly going on in the mining of our coal areas. Provision for inspection to prevent the loss of human life has been made by the provinces; but the permanent waste of very large quantities of valuable coal still goes on."

The war has stimulated mineral production in many lines, including copper, nickel, asbestos, zinc, silver, lead, chromite, cobalt, pig iron and graphite.

"The establishment at Shawinigan Falls of an electrolytic process for recovering metallic magnesium from magnesite has greatly stimulated the production of this mineral. Magnesium

is used in connection with the war for the manufacture of star shells and flares, and as an alloy with aluminum in the manufacture of aeroplane parts.

CANADA'S TRADE GROWS RAPIDLY

AN increase of approximately $273,000,000 for the first seven months of the fiscal year ending with October, as compared with a similar period last year, is shown in the trade statement for October, just issued. For the seven months the trade in the Dominion totalled $1,586,616,258, as compared with $1,313,189,951 last year. For the month of October alone, Canada's trade amounted to $238,834,321. In October, 1918, it aggregated $164,330,179.

Exports of domestic goods for the seven months were to the value of $922,195,134, as compared with $622,049,481 last year. These figures include coin and bullion. Imports for the seven-month period amounted to $636,749,263. During the seven-month period last year imports aggregated $483,132,928. Dutiable goods were to the value of $346,108,703, on which the customs collections amounted to $102,106,365. Free goods imported were to the value of $281,992,997. During the same period in 1916, dutiable goods worth $204,530,818 were brought into Canada, and $82,177,312 was collected in customs duties. Free goods importations were valued at $207,630,667.

Manufactured goods to the value of $420,380,372 were exported, a big increase as compared with last year, when domestic manufactures to the value of $219,461,054 were shipped out of the country.

Agricultural products hold second place in value at $306,159,775, as compared with $233,448,260 last year. Animals and their products to the value of $101,681,970 were exported as against $67,101,478 for the seven-month period last year.

COAL-GAS IN AUTOMOBILES NOT TO BE RESTRICTED

THE British Minister of Munitions has informed the Automobile Association that so long as the gas is conveyed in bags, at or slightly above atmospheric pressure, and is not compressed in steel cylinders, it is not considered that at the present time there is any need on general grounds of restricting the use of coal-gas for motor purposes, though should motorists use coal-gas on any considerable scale it may, in the interests of national requirements, become necessary at some future time to impose certain restrictions on its use.

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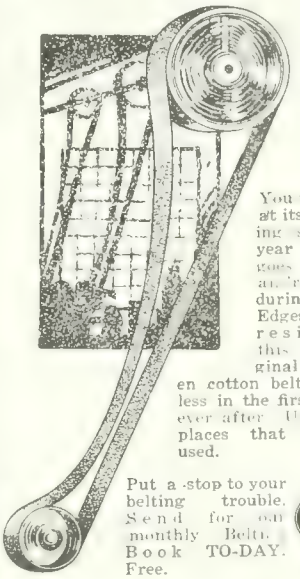

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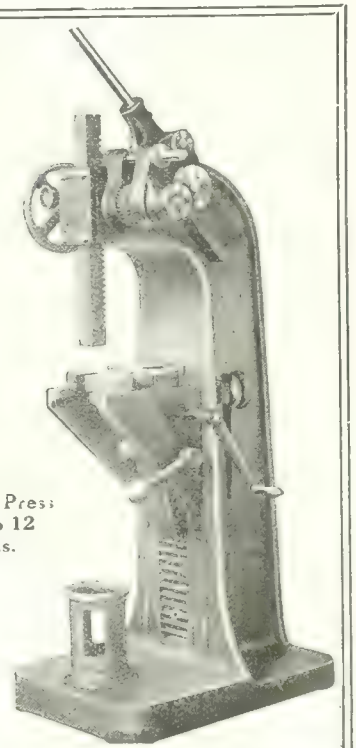

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LET OUR MACHINE SHOP HANDLE YOUR overflow. We have a well equipped shop and can handle turret lathe, engine lathe, shaper, drill, screw machine work, as well as fitting. We will gladly quote you prices. Webber Bros. Machine Co., Dupont St., Toronto. (c26m)

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED A GOOD, HEAVY, POWERFUL, single purpose lathe for 4.5 shells. Send fullest particulars and best price at once. Box 359, Canadian Machinery. (c24m)

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WANTED—VERTICAL MILLING MACHINE with table not less than 26" x 10", minimum distance centre of spindle to face of column 14". Reply, giving full particulars, price and where machine can be inspected. Box 352, Canadian Machinery. c21m

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Twenty-five—53 Spindles, No. 1 Make

New England Butt Co. and R.I. Braiders in perfect working condition. Write for particulars. Greenwood Braiding Co., Greenwood, R.I. (c23m)

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MECHANICAL AND CONSTRUCTION ENgineer desires change; twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery. c21m

GRADUATE MALE NURSE, AGE 32, HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

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PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in Scotland and Canada, a specialist in marine engines and winches, open for engagement; best of references. Apply Box 351, Canadian Machinery. c23m

GENERAL SUPERINTENDENT, WITH PRACtical shop as well as efficient production experience, desires change. One having considerable munition experience, principally shells of various sizes. Box 358, Canadian Machinery. (c25m)

FOR SALE

2—16" x 5' Reed Lathes, elevating rest.
1—16" x 6' Reed Engine Lathe, plain rest.
1—16" x 6' Reed Engine Lathe, R. and P.
1—18" x 8' Davis Engine Lathe, D.B.G.
1—18" x 8' Porter Engine Lathe.
1—22" x 10' Nicholson & Waterman Engine Lathe.
1—No. 3 Brown & Sharpe Automatic Gear Cutter.
1—30" old-style Brainerd Automatic Gear Cutter.
1—5" x 48" Pratt & Whitney Plain Grinder.
1—No. 3 Lees-Bradner Thread Miller.
1—15" Jungst Shaper.
2—24" x 24" x 6' Powell Standard Planers.
2—30" x 30" x 8' Powell Standard Planers.

Brownell Machinery Co.
Providence, R. I.

Are You Thinking of Building?

We have for Immediate Shipment

A STEEL BUILDING 120'x 300' IN TWO BAYS

With Runways for Cranes

If you want a Factory, Erecting Shop, Forge Shop or Structural Shop, it is here waiting for you. Ask us for further particulars.

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PLANERS

66 x 66 x 20" Canada Tool Works, two heads.
52 x 52 x 16 Canada Tool Works, one head.
36 x 42 x 12 Cincinnati, two heads.
36 x 36 x 12 McDougal, three heads.

SHAPERS

14, 16 and 20" Smith & Mills.
16, 20 and 24" Kelly.
20 and 24" Gould & Eberhardt.

DRILLS

15", 20", 25", 26", 28" and 34" Barnes.
24, 26, 28 and 30" Sibley.
6 ft. Bertram Radial.
5 ft. Reed Prentice.
2½ ft. Fosdick Heavy Duty.

MILLERS

3H and 2H LeBlond Univ
No. 2 and No. 3 Cincinnati Univ.
No. 2 Ford-Smith Plain.

MISCELLANEOUS

10 ft. Niles Vertical Boring Mill, two swivel heads.
Bertram Horizontal Boring Mill, 4" spindle.
No. 4 and 23 Niles Bulldozers.
Berque Automatic Multiple Punch —Capacity 18—⅞ holes takes 26 ft. plates.
42" Bertram Car Wheel Boring Machine, hub facing attachment.

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4—6" Williams.
1—6" Hall.
1—4" Hall.
2—3½" Davis.
1—3½" Hurlbut Rogers.

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COMPLETE SHRAPNEL PLANT

Can be seen in Operation, comprising Lathes, Turrets, Presses, etc., including the following:—

7—16" McDougal Engine Lathes
11—No. 2 Warner & Swasey Turrets
15—C. M. C. Turning Lathes
4—Davis Turret Lathes

SIX INCH SHELL MACHINERY

2—Nearly New Hercules Rough Turning Lathes, with Oil Pan and Pump. Used one month.

4.5 SHELL MACHINES

No. 6 Hall Cut-off Machine
Norwood Propting Machine

MISCELLANEOUS

2—25" Foote-Burte Drills
2—18" x 8 Rhan Larmon Lathes, Double Back Geared, Quick Change Gear
1—16" Shaper with Vice and Countershaft
1—16" Crawford Tool Room Lathe, Quick Change Gear, Oil Pan and Pump, Taper Attachment, Draw-in Collet.

The above is only a part of our stock. Let us know your requirements.

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will get the attention of the busy men. They find grouped here a big list of equipment for immediate shipment, and they use it as a catalogue when they need any. Will they see your list?

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16" x 5½' Pratt & Whitney, D.B.G. (3)
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20" x 10' Bridgeport, B.G.
22" x 8' Pratt & Whitney, B.G.
22" x 8' Martin, single purpose (2).
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26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

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6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
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16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 10' Putnam, back geared.
20" x 8' Fifield, B.G., plain rest.
21" x 8' Bawden, heavy duty (4).
22" x 8' Pond, B.G., plain rest.
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (5).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Barnes, 3-spindle, lever feed (2).
20" Baker, tapping attachment.
24" Foote-Burt, heavy duty.
24" Kerkhoff, back geared, power feed.
26" Prentice, back geared, power feed.
32" Cincinnati, heavy duty.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal.
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer (2).
24" Barnes, wet tool.
21¼" Yankee, twist drill (3).

IRON PLANERS

20" x 20" x 5' Bertram (2).
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Pond, two heads
40" x 40" x 12' New Haven, power feed
72" x 72" x 11' Canada, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
No. 2 Cincinnati, universal, cone type.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16" Petrie, back geared (2).
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared (3).
24" Gould & Eberhardt, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin Cutting-off Machine.
No. 2 Grant Rotary Riveting Hammer.
No. 4A High Speed Riveting Hammer.
⅜" Garvin Vertical Tapping Machine.
No. 3½ Greenerd Arbor Press.
No. 180 Brown-Boggs Power Presses (2).
No. 18 Can. Hanson & Van Winkle Power Press.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
1500-lb. Toledo Drop Hammer.
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50-ton Browning Trolley, 5-ton aux., 61' span (new).
20-ton Shaw, 56' 3" span, 110 V D.C.
10-ton Case, 58' 3" span, 220 V D.C.
5-ton Box, 19' span, 220 V D.C.

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Single 48" tht., cap. 3 x 1¼", Providence.
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Single, 27" tht., cap. ¾ x ¾", belted.
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Double 15" tht. cap. ¾ x ¾" Fischer.
Double, Queen City, 12" thts., cap. ⅝" x ⅝".
Double 12" blades, bar shear, cap. 2" sq., crucible.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shear, No. O. H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine 120", cap. 3/16".

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Bolt Cutter, Acme 2", Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 80-lb. Bradley, Cushion Helve.
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, motor driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 V.
Milling Machine, No. 24 Osterlein Universal.
Pipe Machine, 8" E. C. & B.
Pipe Machine, No. 11 Jarecki.

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PROMPT SHIPMENT.

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Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting off Machine, with 15" three jawed chuck
1 Lathe, 28" swing, 8' bed.
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1 Jenckes Copper Band Lathe
1 Geholt Lathe, with 15" three jawed chuck.
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1 Lathe, 14" swing, 6' bed.
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1—37" Bell-mel Lathe, equipped for wavy groove.
1 Drill Press, fitted for screwing in sockets
1 20" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck
1 Double End Painting Machine, with ¾ h.p. motor.
1 Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 220 volts, complete with starting box.
1 Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1 Nosing Press, for nosing shells
1—5 H.P. Canadian General Electric Motor for same.
1 Hoskins Pyrometer.
1 Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
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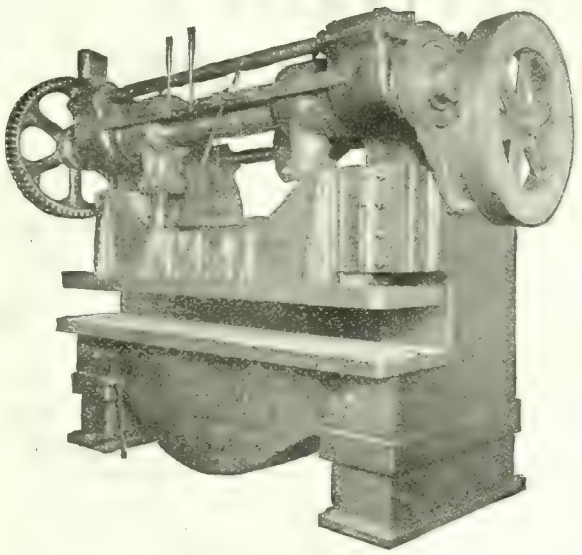

Large Blanking Press

76" between housings, 8" shaft,
3½" stroke, 8¾" die space.

Very good condition and for immediate delivery.

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1—60-ton Watson-Stillman Hydraulic Press, complete with four plunger automatic variable belt pump. $750.00.

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1—Murchey semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ⅛ to ¾". $410.00.

1—Murchey semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ½ to 2". $690.00.

1—Hall semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ½ to 2". $640.00.

1—Hall double-head, semi-automatic Nipple and Pipe Threading Machine with countershaft capacity 1½ to 4". $1000.00.

20—Spicer Steel Trucks, 28 x 90", weight 400 lbs., capacity 2½ tons. Each $25.00.

2—24" Hoefer Stationary Head Drills, steel gears throughout, ball thrust bearings, 3 step cone. $159.00.

Shafting, Belting, Hangers, etc.

GREENFIELD CONDUIT CO., LTD.

331 KING ST., TORONTO, ONT.

(24)

100 NEW LATHES

Here at McCabe's for Immediate Shipmen

These "High Duty" New Lathes will be installed in your shop with understanding there is nothing better built in workmanship — power and convenience in handling.

All-Steel Quick-Change Gear-box

3-step Cone— Doub e Back-Gears

26 in	Swing—	18-ft.	Bed
26 "	"	16 "	"
26 "	"	14 "	"
26 "	"	14 "	"
24 "	"	18 "	"
24 "	"	16 "	"
24 "	"	14 "	"
24 "	"	12 "	"
21 "	"	12 "	"
21 "	"	10 "	"
18 "	"	12 "	"
18 "	"	10 "	"
18 "	"	8 "	"
16 "	"	10 "	"
16 "	"	8 "	"
16 "	"	6 "	"

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"McCabe" Double Spindle Lathe

26-18-in. SWING; 12-ft., 22-ft. and 24-ft. Beds in stock.

So many other Tools in Stock — you will have to get our latest Bulletin 283 — just issued — to get complete list of everything.

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30" Lodge & Davis S.H., B.G., P.F.
4 Manning Plain Radial
Expansible Rockford
Expansible Rockford
Expansible Washburn, with power feed
Expansible Allen
No. 11 Pratt & Whitney, 10 spindles

GEAR CUTTERS.

No. 1 Schachardt & Schutte Gear Hobber

GRINDERS.

Brainard Cutter
Leland Universal, with power feed

LATHES.

16" x 6 LeBlond, C.R., with chuck
24" x 6 Rockford, C.R.
16" x 6 Rockford Tool Co., C.R.
26" x 8 Bradford, C.R.
18" x 6 Bradford, C.R., taper attachment.
18" x 8 Lodge & Shipley, pat. head, C.R., taper attachment.
20" x 14 Waisdell, C.R.
24" x 12 New Haven, C.R.
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24" x 12 Reed-Prentice, geared head, single pulley drive.
32" x 12 Schumacher & Boye, 28" chuck, fitted.
36" x 18 Schumacher & Boye, T.B.G., Q.C.G.
36" x 20 American, T.B.G.

PLANERS.

24" x 24" x 6 American, one head.
26" x 26" x 8 Pease, one head.
36" x 36" x 12' Rockford, 4 heads.
36" x 36" x 14 Sellers, one head.
39" x 39" x 12' New Haven, one head.

SCREW MACHINES.

No. 1 Warner & Swasey, plain head.
No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Pratt & Whitney, B.G., double friction head, A. C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, A.C., P.F. to turret slide, and P.F. to cross slide.
1 ⅝" Gridley, 4-spindle automatic.
4 ¼" Gridley, 1-spindle automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24" J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3-A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 2 Rockford, O.B.I.
No. 3 Loshbough-Jordan, O.B.I.
No. 4 Rockford, O.B.I.
No. 74½ Bliss, str. side, geared.
Blake & Johnson Embossing.

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1" Nutter & Barnes Cutting-off Machine.
6" x 48" P. & W. Thread Miller.
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20 H.P. Nash 2-cylinder Vertical Gas Engine.
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14,000 SQUARE FEET OF FLOOR SPACE

Saw tooth construction; total of 2½ acres of ground located on railroad in prosperous central Ontario city. Ideal for munition factory. Considerable amount of shafting, motors, etc., in good condition.

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BORING MACHINES Vertical
2—32" Bullards, 1 turret head
2—37" Baush, 2 heads.
1—37" Bullard, 2 heads.
1—42" Bausch; 2 swivel heads, quick change.
1—42" Bullard, two swivel heads.
2—40" Niles, 2 swivel heads

BORING MACHINES—Horizontal.
1—2½" bar, Niles.
1—No. 2 Barrett, 5" bar.
1—Beaman & Smith, 7" spindle
1—Barrett, 8" bar.

BULLDOZERS.
1—No. 2 Williams & White, 16" stroke
1—No. 4 Ajax, 20" stroke
1—No. 9 Williams & White, belt drive
1—No. 12 Ajax, single pulley drive
2—No. 23 Williams & White, belt drive.
1—No. 25 Williams & White, belt drive.
1—No. 29 U Williams & White, arranged for motor drive.

CRANES—Traveling.
1—8-ton Chisholm & Moore, 135' span, hand power.
2—10-ton Electric, 47' span, 25' lift, 2 motors
1—10-ton Toledo, 3 motors, 30' span
1—10-ton Whiting, 48' 8" span.
1—10-ton Whiting, 3 motors, 24' span

CRANES Locomotive.
3—10-15-ton McMyler Broad gauge Steam Locomotive, 60' boom, bucket, 3 drums.
1—15-ton Browning 8 wheel, 38' boom
1—15-ton Brown Hoist Locomotive 36' boom bucket, 8 wheels.
1—20-ton Orton & Steinbrenner, steam locomotive 8 wheel double drum, 37' boom, bucket.
1—20-ton Brown Hoist, 8 wheel, 40' boom, bucket
1—20-25-ton Industrial, 8 wheel, 50' boom, bucket
1—25-35-ton Myler, 8 wheel, 70' boom, bucket.

CUTTING-OFF MACHINES.
1—NEW 4½" Davis.
30—Davis, 4½"
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES Radial
3—NEW 3' Mueller, speed box drive; January del
3—NEW 3' American, Sensitive, tapping attachment.
2—4' Mueller, plain, speed box drive
1—4½' Full Universal, cone drive
1—NEW 5' Western Plain, with motor.
3—NEW 5' Mueller, speed box drive, January del
2—6' Reed Prentice, latest type, belt driven, January del.
1—NEW 6' Triumph, motor drive, January del

DRILLING MACHINES Heavy Duty.
2—D-2 Colburn Heavy Duty 3½" cap., arranged to motor drive.
1—Foote-Burt Heavy Duty 2½" capacity.
1—No. 310 Baker, single pulley drive, late type arranged for motor drive
10—Molme Hole Hogs heavy duty 2½" cap.

DRILLING MACHINES—Sliding Head.
2—NEW 25" Cleveland, high duty
5—NEW 28" Sibley.
2—NEW 30" Sibley
2—NEW 34" Barnes; December delivery

DRILLING MACHINES—Multiple Spindle
1—4-spindle 20" Barnes, all geared.
1—No. 5 Fox, 12-spindle, 1" capacity.
2—6-spindle Rockford Economy type

GEAR CUTTING MACHINES
8—No. 3 Brown & Sharpe Auto Gear Cutter spur
1—No 2A Newark, 2¾" x 8" capacity
1—36" Newark.
1—36" Whiton, for spur gears.
2—36" x 9" Gould & Eberhardt new type spur gears
1—NEW 6" Standard Gear Cutter spur
1—15" Gleason Bevel Gear Planer
2—20" Grant-Lees Gear Hobber, bevel spur and spiral attachement.
1—24" Becker Brainard
1—28" Rhemania Gear Hobber, spur and worm gears
2—NEW 34" Fellows solid pattern
3—36" Fellows Gear Shapers.
1—NEW 37" Gleason Gear Bevel Planer; Feb. delivery.
1—72" Gould & Eberhardt, spur and bevel

GRINDERS Universal for Cutters, Drills, Reamers, Etc.
5—NEW No. 190 Wells.
2—No. 1 Cincinnati
1—NEW Gisholt Universal.
1—NEW Premier Universal
1—NEW Wilmarth & Morman, style B K
1—NEW Walker No. 1, outfit B
1—NEW Walker No. 2 outfit K, capacity 9"x26"
2—NEW No. 2 Oesterlein, Universal
3—NEW LeBlond

GRINDERS Cylindrical Plain
3—NEW 8" x 30" Modern Self-contained.
2—NEW 12" x 24" Modern Self-contained.
4—12" x 36" Modern Self-contained
2—12" x 42" Landis, Self-contained.
5—12" x 48" Modern Self-contained
1—12 x 66" Landis.
1—NEW 16" x 48" Landis, crank shaft
1—42 x 96" Springfield

GRINDERS Cylindrical, Universal
2—NEW No. 2 Bath, 9" x 30".
1—NEW No. 2 Walker, 9" x 30"
1—NEW 2½ (16" x 36" Bath.)
1—NEW Thompson 10 x 36".
1—12 x 36" Cincinnati.
1—No. 4 Cincinnati, capacity 12 x 72".

GRINDERS Internal
1—No. 24 Bryant
1—No. 70 Heald.
1—No. 75 Heald

GRINDERS Disc.
1—NEW No. 4 Gardner, including disc press, 2" disc.
3—No. 14 Besley, including ring, wheel, chucks
1—NEW No. 17 Gardner, 30" disc.

GRINDERS—Cylindrical.
1—No. 60 Heald, single pulley drive.

GRINDERS Surface
1—NEW No. 1 La Salle Plain, with Micro Adj
1—NEW No. 1½ Walker's, complete.
1—NEW No. 2 Reid Same as B & S.)
1—3" Pratt & Whitney Vertical, Magnetic Chuck
12—Carrigus type, mag. chuck.

HAMMERS—Board Lift Drop
3—300-lb. Williams.
1—No. 4 Standard Machinery Co. 400-lb.
1—E. W. Bliss, 800-lb.
1—1500-lb Toledo
1—3000-lb. Williams & White.

HAMMERS—Steam Forging.
1—600-lb. Niles, single frame.
1—1500-lb. Niles.
2—3500-lb. Chambersburg Steam Drop Hammers.
2—5000-lb. Chambersburg Steam Drop Hammers
1—7000-lb. Morgan Special Double Stand.

KEYSEATERS.
1—No. 1 Cathn.
1—No. 2 Mitts & Merrill.
1—Colburn 4", capacity 43" stroke.
1—No. 2 Knowles, 60" stroke.

LATHES—Manufacturing, not Screw Cutting
2—NEW No. 3 Harding Brothers, Bench Lathes.
1—16" x 6' Prentiss, geared head, quick change, taper attach
70—NEW Simplex 16" x 8'.
14—Reed Prentice Shell Lathes for 4" or 18-lb American Shells.

LATHES—Engine.
4—NEW 15" x 6' Rockford.
1—NEW 14" x 6' Hendey, Geared Head.
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment.
1—NEW 17" x 8' National Quick Change, Double Back Gears.
10—17" x 6' LeBlond, heavy duty, auto type, not screw cutting
12—NEW 17" x 8' LeBlond Pan Bed, Quick Change Gears.
1—18 x 8 Prentiss, geared head, taper attachment quick change.
1—20 x 8 Lodge & Shipley, quick change turret on ways.
1—NEW 20" x 10' Cleveland Geared Head.
2—20" x 10' Lodge & Shipley, quick change
19—NEW 21" x 10' Porter, S.B.G
7—22" x 10' Putnam, oil pan and pump
1—NEW 24" x 10' American high duty quick change.
2—24" x 10' Lodge & Shipley quick change
1—24" x 10' Schumacher & Boye quick change taper attachment
1—NEW 24" x 12' McCabe Double Spindle
1—NEW 24" x 18" x 72' McCabe Double Spindle
1—NEW 26" x 14' Bridgeford pattern geared head heavy pattern
1—27" x 12' Bridgeford Heavy Duty, plain turning 2 carriages, motor driven.
1—NEW 30" x 14' American Double Back Geared Quick Change
1—32" x 14' Lodge & Shipley Single Pulley Drive Quick Change
1—NEW 32" x 12' Pittsburg Pattern
1—36" x 12' Putnam two plate drive
1—30" x 12" Pond triple geared quick change
6—40" x 18' Pittsburg quick change gear, face plate drive.
1—NEW 42" x 24' Triple Geared, Houston Stanwood, Heavy Duty
1—50" x 24' Prentiss
1—54" x 22' Worcester Triple Geared
1—58" x 18' 6" Dodge Lathe Very Heavy
1—NEW 60" x 36' Putnam Triple Geared Face Plate Drive 5-step Cone, 6½" belt Oct del
1—84" x 18' Special Boring Lathe

LATHES—Turret.
8—NEW 21" Gisholt H-21.
2—21" Gisholt, 18" chuck, quick traverse taper attachment
5—2 x 24 Jones & Lamson.
1—NEW 18" Libby.
3—24" Libbey, Universal Facing Head, 3-jaw chuck
18—6A Potter & Johnson.
1—24" Brown & Sharpe Vertical, chucking mach.
1—NEW 24" New Britain, arranged for motor, like almost new

MILLING MACHINES Knee Type Universal
1—No. 2 Kempsmith Vertical Attachment
1—No. 2 Kempsmith 13" Dividing Head.
1—No. 1½ Cincinnati.
1—NEW No. 2 Rockford High Power
2—NEW No. 2 Garvin.
1—No. 2 LeBlond.
1—NEW No. 3 Cincinnati High Power, Jan del
1—No. 3-H LeBlond Heavy Duty; almost new.
1—No. 25 Oesterlein.
1—NEW No. 34 Oesterlein Heavy Duty; latest type.

MILLING MACHINES Knee Type, Plain
1—No. 0 Cincinnati
1—NEW No. 2F Brown & Sharpe Low Type
1—NEW No. 2 Rockford
2—No. 2 Cincinnati
1—No. 3 Cincinnati, single pulley drive.
1—No. 3 LeBlond.
1—NEW No. 3 Cincinnati
1—No. 5 Kempsmith
1—No. 15 Garvin.

MILLING MACHINES Duplex
1—No. 1½ Van Norman, almost new.
1—No. 2 Garvin Spiral.

MILLING MACHINES Hand
1—No. 1 Bickett.
1—NEW No. 2 Pratt & Whitney
1—NEW No. 3 Garvin.
1—NEW Becker, table 20" x 5½".

MILLING MACHINES Vertical
1—No. 2 Cincinnati latest type with circular table, as good as new.
1—No. 2 Pratt & Whitney.
1—No. 3 Cincinnati Heavy Duty.
1—No. 3 Ingersoll
1—NEW No. 5 B Becker Rotary Table.
1—Newton Vertical, Continuous, Motor Driven, for shell work.

MILLING MACHINES Planer Type
1—No. 2 Beaman & Smith.
1—Ingersoll Slab 16" x 48" capacity.
1—NEW 17" x 5' Eynon Planer Type.
1—30" x 30" x 8' Ingersoll No. 928, Single Spindle with Motor.

MILLING MACHINES—Lincoln Type.
1—Boggs type high duty
1—NEW No. 1 Sterling
14—No. 7 Becker.

PLANERS.
1—NEW 24" x 24" x 6' Powell Single Head
1—24" x 8' Detrich & Harvey, open rib.
1—26" x 10' Gray, 1 head.
1—24" x 24" x 10' American, 2 Heads
1—26" x 26" x 12' Pond, one head.
1—Rotary Planer, Motor Driven
1—42" x 36" x 8' Gray, One Head.
1—42" x 42" x 14' American, 2 heads.
1—42" x 42" x 14' Butler high speed 3 heads, almost new
48" x 48" x 12' Steel Heavy Type Milling Attachment on Rail
1—48" x 48" x 16' Betts, 2 Heads
1—60" x 60" x 20' Pond, 3 Heads
1—42" x 42" x 20' Canada Tool Works Planer, 2 Heads.
1—72" x 48" x 14' South Globe, 2 Swivel Head.

PUNCH AND SHEARS
1—Whitcomb Ferrell Alligator Shears cap 2½"
1—Cincinnati Gap Shears, 17" gap 7/8" blade, 1¼" capacity
1—No. 1116 Toledo Squaring Shears capacity 9/16" weight 17000 lbs.
1—Hydraulic Punching Shear 2" throat capacity 1" x 1"
1—Providence Steam Driven Punch 48" throat, up 7" stroke 12" above bed
1—Bertsch Punch and Shear

SCREW MACHINES Hand
1—No. 0 Brown & Sharpe
1—1" Pierce.
10—NEW No. 2 Davis Keli, wire feed automatic chuck 1/4 to 3/8" capacity
1—2" Cincinnati Acme turret geared head

SCREW MACHINES Automatic
NEW 5/8" Cleveland, Model A.
3—1¼" Cleveland, Model B, full auto.
1—NEW 1¼" Gridley Mult Spindle, Belt Driven
1—1¼" Gridley mult spindle, good as new
5—2¼" Gridley mult spindle arranged for motor drive.
2—3¼" Gridley single spindle
4—4¼" Gridley, single spindle.
1—No. 0 Pratt & Sheets
2—No. 1 Brown & Sharpe.
1—No. 2 Brown & Sharpe.
1—No. 4 National Acme multi spindle 3¼" cap

SHAPERS
1—NEW 16" Springfield.
1—16" Motor Driven Rockford
5—NEW Barker 24"
2—NEW 24" Milwaukee.
2—NEW 24" Potter & Johnson, Universal Rotary Table.
1—25" Springfield.
2—24" Morton Draw Cut.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL.	CINCINNATI, OHIO	CLEVELAND, OHIO	NEW YORK CITY
549 Washington Blvd.	Union Central Life Bldg.	Leader News Bldg.	Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

If any advertisement interests you, tear it out now and place with letters to be answered.

SPECIAL MACHINERY

Special Machinery, Gears, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Etc.

CONTRACT WORK

SPECIAL MACHINERY

MANUFACTURING PUNCHES

Dies, Jigs, Fixtures—any Special Machinery you may need—is our business. Equipped as we are to do your work right and promptly, probably the cost will be less than you expect. Write

MADE IN BR·EN·CO CANADA

Brown Engineering Corporation
LIMITED, TORONTO
415-419 King St., W. Tel. Adel. 425

F. W. McCLEAN & SON

CONSULTING AND MECHANICAL ENGINEERS
NIAGARA FALLS ONTARIO

Designers and Builders of Special and Automatic Machinery. Experimental and Metal Pattern Work. Electric Welding Machinery. Wire Forming Machinery.

WELLAND MOTOR & MACHINE CO.

WELLAND, ONT.

Builders of Special Machinery,
JIGS, GAUGES AND SPECIAL TOOLS.
General Machine Shop Work of all Descriptions.
Bids Submitted on all Classes of Contract Work.

"SERVICE"

At This Period "Service" is our

MOTTO

With our well equipped Tool Dept. we are in a position to give you immediate Service on all kinds of Tools, Gauges, Jigs, Fixtures, Dies, General Machine Work.

Equipment Overhauling

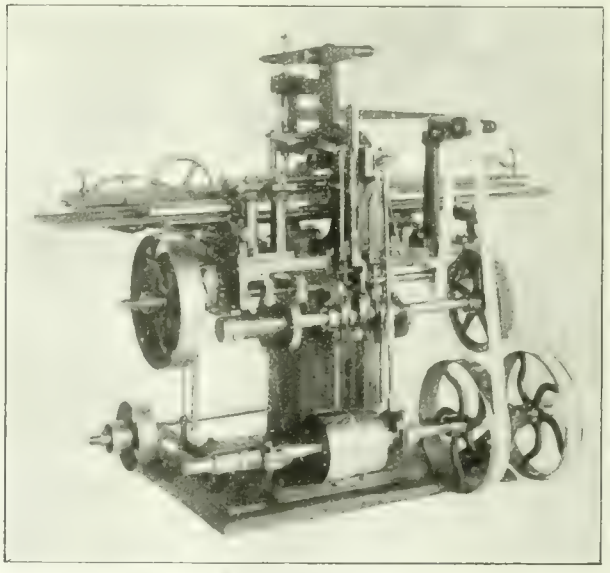
We also make Metal Stampings, Brass and Aluminum Castings.

ELECTRO-PLATING.

Monarch Brass Mfg. Co., Limited.

71 Browns Ave. TORONTO

We will show here from time to time some machines we build that you may judge our capabilities in this line.



Balance Rail and Keyframe Boring Machine

Manufactured Solely By

TORONTO TOOL CO.,

TORONTO, ONT.

516 Richmond St., West Phone Adel. 1181

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

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Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

Homer & Wilson
Stamping & Tool Works

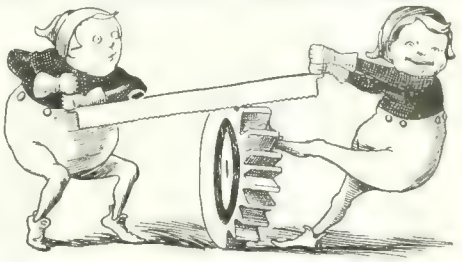
WE MAKE THE TOOLS
AND
PRODUCE THE STAMPINGS

Let us quote on your requirements.

1-3-5 Lancaster Street
Hamilton, Ontario

We Cut Gears

Rawhide, Steel, Iron, Brass.



We Make Grinder Heads, Power Hack Saws, Friction Pulleys, Index Heads.

We cut racks any width, any pitch, to 8 feet in length.
DESIGN AND BUILD SPECIAL MACHINERY

WINNIPEG GEAR & ENGINEERING Co.
197-199 PRINCESS ST., WINNIPEG

PUNCH PRESS WORK

What Can You Save?
By Using Parts Made in the Punch Press

Look over your standard parts, Mr. Manufacturer, and see what parts can be made (or could be made by slight change in design) by this process.

You will be surprised at the saving you can effect.

We make Blanking, Perforating, Drawing, Forming and all classes of dies and tools for plain or difficult stamping to suit the production required.

A Battery of presses is also available at our plant to manufacture parts for you with the understanding that you pay only for good parts made. Our facilities ensure prompt deliveries at right prices.

W. H. BANFIELD & SONS LTD.
370-386 PAPE AVE., TORONTO.

If any advertisement interests you, tear it out now and place with letters to be answered.

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

GEARS

HAMILTON

GEAR & MACHINE CO.

Cor. Concord & Van Horne **TORONTO**

ACCURACY IN CUTTING makes SILENT POWER

Shell Manufacturers

Who expect **New Shell Orders** either from **Canada** or the **United States,** may need some of their shell equipment **overhauled** and **repaired** or **rebuilt.** We can handle it **completely, satisfactorily** and **promptly.**

NOW IS THE TIME.

The
Preston Machinery Co., Ltd.
PRESTON :-: ONTARIO, CANADA

21

Consult these firms

If you are too busy, or if your plant is not equipped to handle all parts of your contracts, let these firms help you.

Consult them before placing your order. They are fully equipped for handling the work they specify — gears, small stampings, screw machine products, jigs, fine tools, etc.

These firms have confidence in their ability to help you, else they wouldn't advertise their services. You'll find the reason for their confidence if you place your problems before them.

And if you have the facilities for doing work of this sort, advertise it. When a probable user of your services looks over the list here, have your message where he will see it.

Rate cards and further particulars on application.

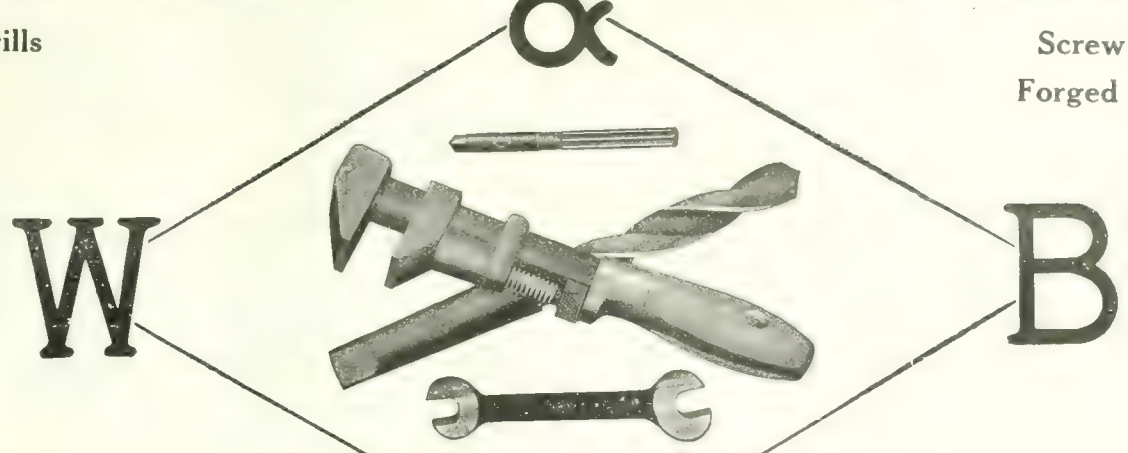
Canadian Machinery
Contract Work Section
143-153 University Ave., TORONTO

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

WHITMAN & BARNES

Twist Drills
and
Reamers

Screw and Drop
Forged Wrenches
Hammers



Special
High Grade
Drop Forgings

Cotters
Chisels
Punches, Etc.

Users recognize "W & B" Tool Quality, backed by 64 Years' Uninterrupted Experience. If your Jobbers and Dealers cannot supply, write us and we will see that you are supplied. Send for Catalog No. 90.

THE WHITMAN & BARNES MFG. CO.

ESTABLISHED 1854

CANADIAN OFFICE AND FACTORY ∴ ∴ ST. CATHARINES, ONTARIO

YOU'LL FIND WHAT YOU WANT

In the Classified Advertising Section of Canadian Machinery. Watch it each week for all kinds of new and used machinery.

YOU MAY WANT WHAT YOU FIND.

STEEL TUBING

Dependable Quality

BUTT JOINT and WELDED

14 to 20 gauge, sizes $\frac{3}{8}$ in. to 2 in. Outside Diameter

For all kinds of manufacturing purposes

Standard Tube & Fence Co.
Limited
Woodstock, Ontario

Manufacturers of
Tubing, Steel Fence Posts, Wire Fencing, Wire, Farm Gates, Etc.

Uniform in Size

If any advertisement interests you, tear it out now and place with letters to be answered.

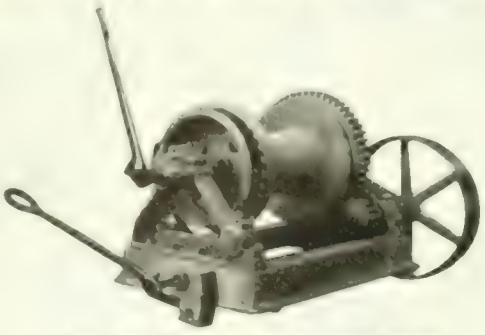
INDUSTRIAL CARS

of the right kind for your work, and

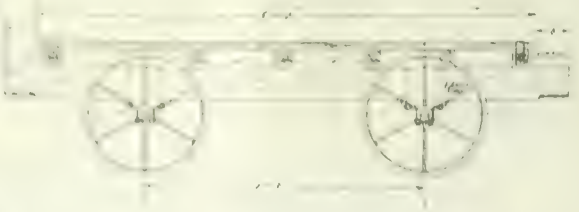
BELT HOISTS

to move them rapidly

Reduce Overhead Charges



Made with one, two, three or more Drums, as required, and with any diameter Drum.



We make cars to suit you and your work

We make them with wood body or steel body of any size or shape desired, and for handling any kind of material, hot or cold, light or heavy, wet or dry.

Let us send you photographs of special cars we have made for others. They will interest you.

Our experts are at your service, free of charge, to help you design equipment whereby you can handle your materials, of whatever sort, more quickly and at a greatly reduced cost, and so **Reduce Your Overhead.**

Marsh & Henthorn, Limited, Belleville, Ontario

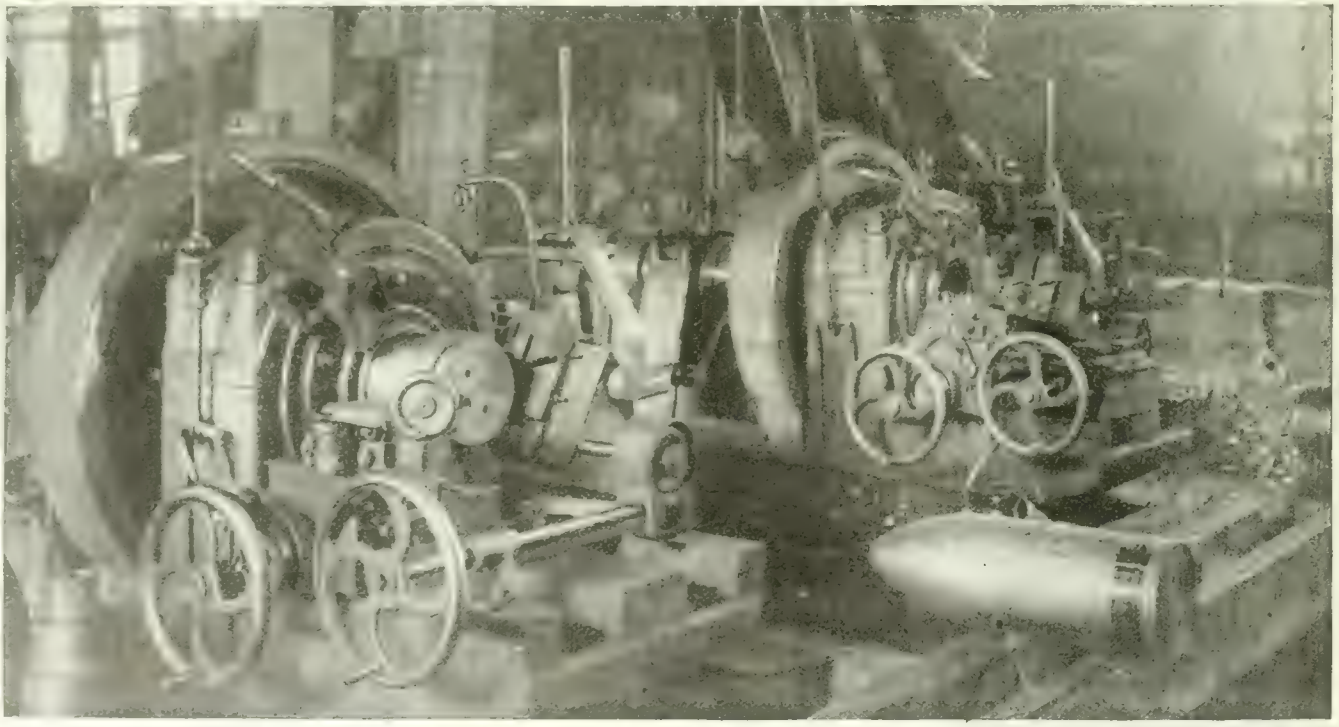


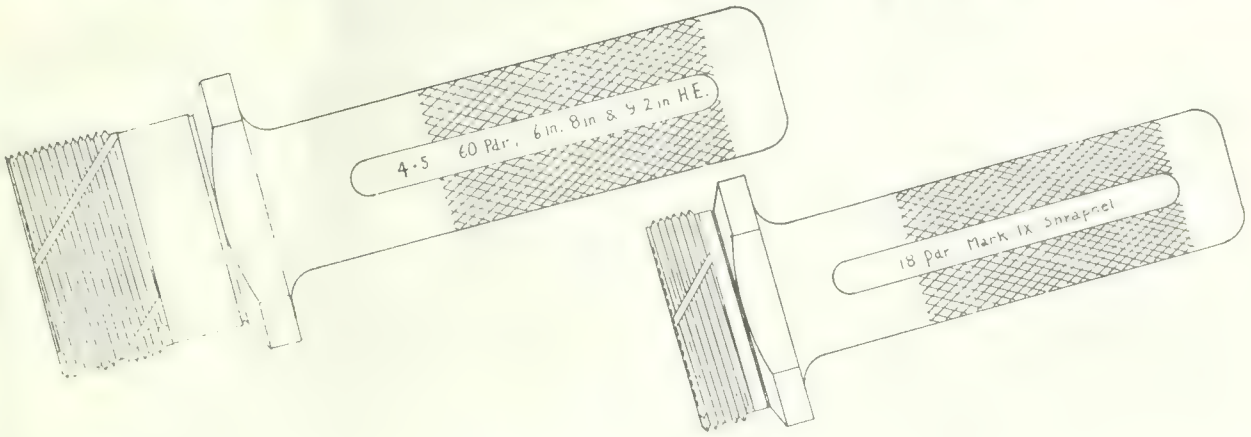
Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. **Write for full particulars and price.**

Bennett Ave. **Warden King Limited** Maisonneuve, P.Q.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

FUSE HOLE GAUGES

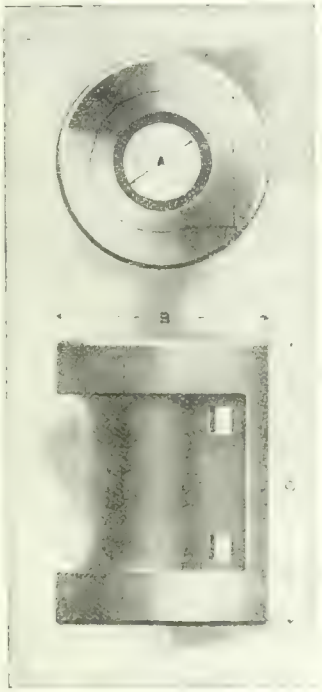


Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

Mining Machinery Parts



Two-key Tappet

Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

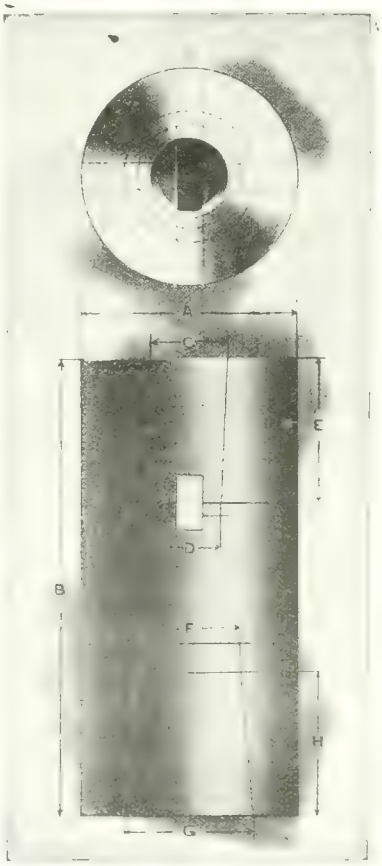
Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

Any size up to 18 feet in diameter. No patterns needed.

Send Us Your Specifications, We Do the Rest. Write—

Hull Iron & Steel Foundries, Limited
HULL, P.Q.



Stamp Head

If any advertisement interests you, tear it out now and place with letters to be answered.

Oxy-Acetylene Welding and Cutting

Strength and Neatness in Manufacturing and Repairing

This illustration shows a Prest-O-Lite operator welding parts in the factory of the Packard Motor Car Co., where neatness and strength are essential.

The Prest-O-Lite Process of oxy-acetylene welding has been adopted as standard practice by thousands of factories, mines, machine shops and shipbuilding plants, both in Canada and the States. In the production and finishing process results in increased strength with reduced weight in vital parts, while effecting substantial savings in cost of material and labor.

Prest-O-Lite PROCESS

For repair work it is invaluable. It saves in repairing time and avoids delay. Worn and broken metal parts are welded, restored and put back into useful service, avoiding costly tie-ups and delays. The actual saving on one Prest-O-Lite repair often more than pays for the entire welding outfit.

The Prest-O-Lite Process employs both gases—acetylene and oxygen—in portable cylinders. Prest-O-Lite Dissolved Acetylene can be had anywhere by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Manufacturers, Mining and Production Engineers will find our welding literature full of valuable data and helpful suggestions. It may help you to reduce your costs and improve your methods. Write for it to-day.

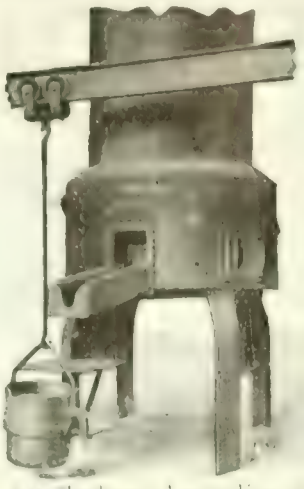
Address Dept. C-107.

THE PREST-O-LITE CO., INC.

CANADIAN GENERAL OFFICES:
Prest-O-Lite Building
Cor. Elm Street and Centre Avenue
TORONTO

Direct Factory Branches: Toronto, Ont: Montreal, Que.: Merritton, Ont.: Winnipeg, Man.
Canadian Plants: Toronto, Ont.: Merritton, Ont.: St. Boniface, Man.; Shawinigan Falls, Que.

World's Largest Makers of Dissolved Acetylene



Overhead Trolley Systems

are invaluable in light work foundries for delivering molten metal, collecting and delivering castings, and distributing flasks and supplies, etc.

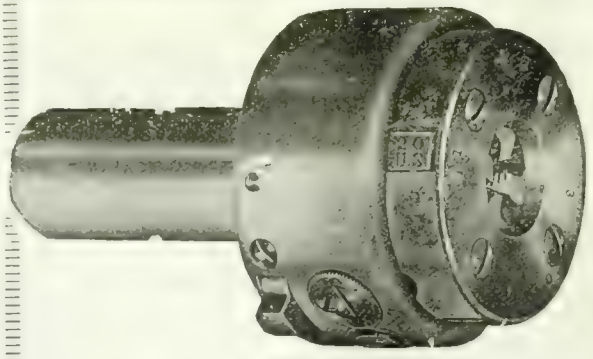
Any point in foundry or shop is easily reached, even remote corners. Extensions readily made.

Save Labor, time and floor space.

Send for Catalog No. 111.

Complete Foundry Equipments
Cranes of all kinds

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB



Thread Accuracy

Are you satisfied with your threads? Are they all you desire? Do you wish to get better results?

That last question interests us vitally. Our Self-Opening Automatic Die Head will chase your troubles. Its quick release feature not only insures the cutting of the thread to a given point every time, but permits cutting right to the shoulder where required.

Our booklet will tell you about other features.

Eastern Machine Screw Corp.

H & G

New Haven, Conn., U.S.A.

INGOTS

Brass, Bronze and Composition

Any Alloy According to Your Formula

ALSO

INGOT-COPPER

99.9% PURE

For High-Grade Castings

Wire or Write for Prices

We are Purchasers of Copper Bearing Material

BROWN'S COPPER & BRASS ROLLING MILLS, LIMITED

NEW TORONTO, CANADA

Near Toronto

Oxy-Acetylene Welding and Cutting

A corner of one of L'Air Liquide Society's Canadian factories for manufacturing Oxygen and Dissolved Acetylene

What that word "Service" means to you

The Oxy-Acetylene Process to be the means of saving gas money, time and labor, must be supported by an efficient service for users (Oxygen and Dissolved Acetylene). On this alone depends the success or failure of the process when applied to your industry. Neither effort nor money expenditure has been, or is being, spared to give the word "Service" its true and distinct definition, so that you may derive ALL the benefits from the process when applied in conjunction with "A.L.S." apparatus and "A.L.S." service.

When in the market for Oxy-Acetylene apparatus, before making a final decision, ask for particulars of our service which is worth many times more to you than the value of any apparatus you can buy. Being the pioneers of the process throughout the world from the time of its inception, our advice is invaluable to you and guards you against possible disappointment—and it is free for the asking. We shall be pleased to give you ALL particulars as to how you may benefit by the process.

Our success is your best guarantee of satisfaction.

The Pioneers of the Process throughout the world

L'AIR LIQUIDE SOCIETY

Manufacturers of Oxygen Dissolved Acetylene and all requisites for the Process

CANADIAN FACTORIES:

TORONTO MONTREAL WINNIPEG HALIFAX: Under Construction

COMMERCIAL ACETYLENE IS USED IN LARGEST SHIPBUILDING PLANTS

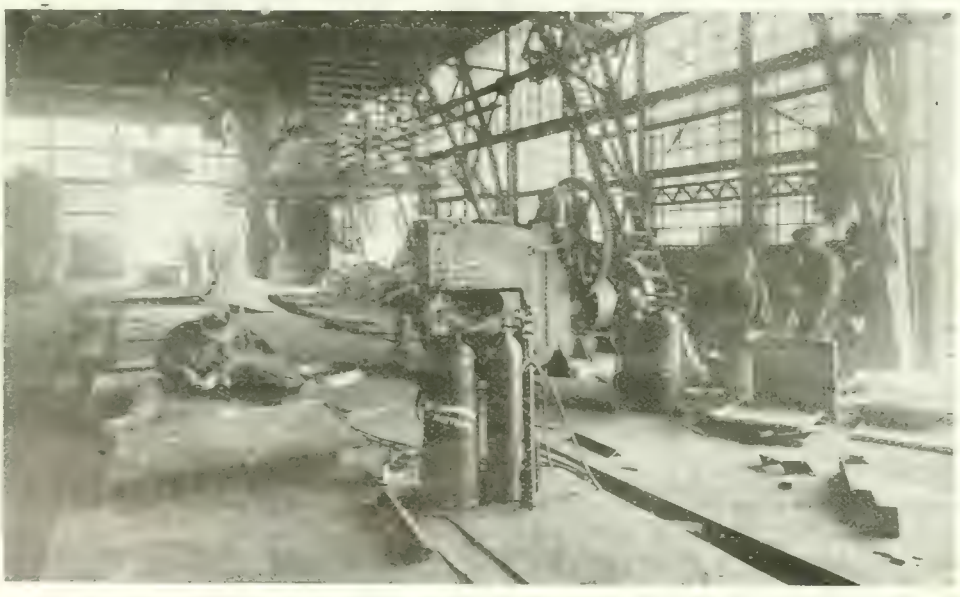


Illustration shows Commercial Acetylene cutting ship plates in one of the largest shipbuilding plants in Canada. We guarantee both quantity and quality of Commercial Acetylene. Write our nearest office about your supply.

MAIN OFFICE:

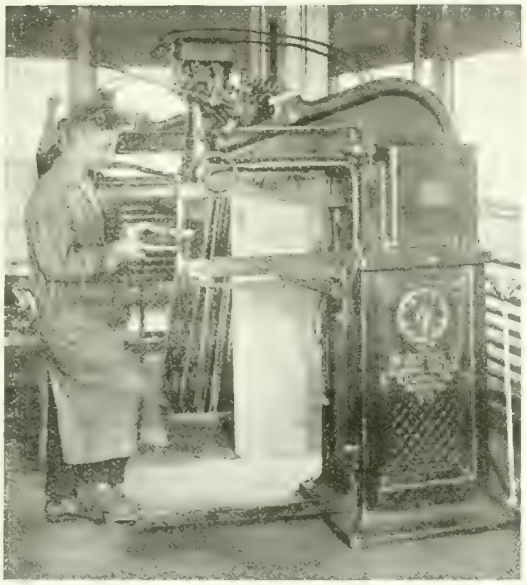
80 Broadway, New York

BRANCHES:

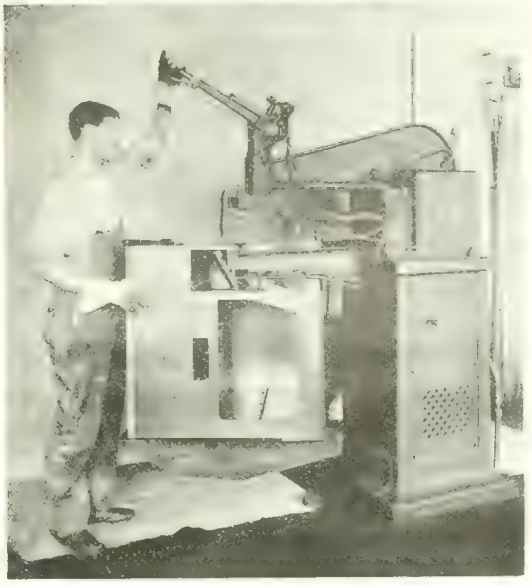
ATLANTA, GA.
AURORA, ILL.
BOSTON, MASS.
BOUND BROOK, N.J.
EAST DEERFIELD, MASS.
SAN FRANCISCO, CALIF.
MOBERLY, MO.
W. BERKELEY, CALIF.

COMMERCIAL ACETYLENE WELDING CO., INC.

18 TORONTO STREET, TORONTO



In a plant manufacturing steel office furniture the first Winfield Spot Welders effected such a saving that several additional Winfields have since been installed.

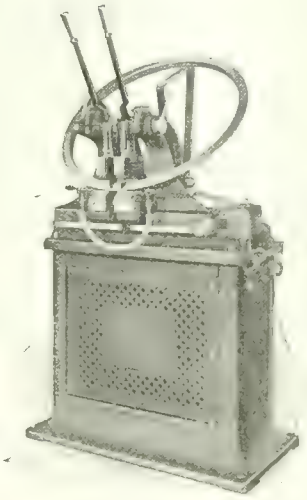


There are 75 spot-welds on one side of this range body, and they were formed in less time than 15 rivets could have been inserted and hammered down.

The Winfield Way Makes Good on Stoves and Office Furniture

AND the "Winfield Way" will make good for you, too,—no matter whether you weld sheets, tubes, angle irons, or what not—as it has made good for a host of satisfied customers.

Winfield Welders are made to make good! Their construction and design have been perfected by exhaustless experimentation. Their operation is simple; they consume little power, heat rapidly and uniformly and perform their work quickly and economically.



The range of work possible with a Winfield Welder can only be realized when you understand that we are able to offer a machine for every conceivable sort of metal spot or butt welding.

Whether you operate a small job shop where the work varies in form and shape, or a large shop where much duplication work is necessary, there is a Winfield Welder for you—ready to point the way to untold savings of time and labor.

Send for booklet "Electric Welding by the Winfield Way"

The Winfield Electric Welding Machine Co.

Warren, Ohio

Canadian Office:
31 Ottawa Bank Bldg., Montreal, Que.

If any advertisement interests you tear it out now and place with letters to be answered.

Mr. Bruce's Counsel

SPECIFICALLY APPLIED, MR. BRUCE'S COUNSEL may be said to recommend that business men should read every week THE FINANCIAL POST OF CANADA, to inform themselves concerning current events in the realm of Canadian business and public affairs.

Frank E. Mutton, Vice-President of the International Time Recording Company, of Canada, wrote the following letter to the publishers of THE POST:

> **Attention, Editor:**
>
> Recently we sent you a subscription covering the delivery of THE FINANCIAL POST to each of our Sales Agents and Salesmen throughout Canada. This was prompted by the fact that, in our opinion, your paper is the best barometer in Canada of what is going on in the different industries from one ocean to the other in this country. Your paper contains information invaluable to any traveling representative of any firm.
>
> (Signed) F. E. MUTTON.

Dated Oct. 12, 1917.

IN effect, THE FINANCIAL POST represents a Current Events Club, met weekly for the consideration and study of current affairs in Canada in relation to itself and the world at large. It represents the assembly of many, many surpassingly well-informed contributors who discuss intelligently, lucidly and proportionately, Canada's public and business affairs. No more stimulating and worth-while paper is published in Canada for the man who wants to be able to talk confidently, at the club, luncheon, board meeting, business council, public meetings, about Canadian public affairs.

THE price, $3, is nothing to the man who really wants to know. Three dollars spent for knowledge that multiplies a man's power and pleasure and satisfaction is a small, small sum to pay. We make our appeal for subscriptions to men who really want to know and who will take time each week-end to read profitably.

If you are willing to give this time, prove it by signing and mailing the coupon below

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.....1917

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Talk Current Events

A Talk by H. Addington Bruce, Author of "The Riddle of Personality," "Psychology and Parenthood," Etc.

WHAT do you know about the doings in this great world wherein we live?

Do you try to form a really intelligent and well-considered opinion regarding events the world over?

Do you ever discuss their significance with friends and neighbors?

If asked what you think of any particular event, you are perhaps ready with an answer. Is your answer anything but a snap judgment, determined by prejudice rather than by reasoning analysis?

I put these questions not to be disagreeable, but because, if necessary, I want to spur you to appreciate the value that there is in discussion of current events.

Many people, fortunately, appreciate its value instinctively. Perhaps you are one of these. Many others are beginning to appreciate it.

This is shown by the growing popularity of clubs and classes on current events.

Only a few years ago such clubs and classes were almost unheard of. To-day most of our bigger cities have half a dozen of them or more.

In one city Boston a talented woman of my acquaintance draws an income of thousands of dollars a year from her leadership of current events classes.

Other men and women have similarly discovered that interest in current events is increasing so rapidly that they can well afford to organize classes like those conducted by the Boston woman.

Still, there remain many people—thousands of people—who never discuss current events. Many thousands more discuss only such events as come under the headings of "crime," "the theatre," and "sports."

These are the people I want to reach. They are the people I want to rouse to recognition of the practical helpfulness they will find in discussion of current events in general.

Current events clubs and classes might well be organized in every neighborhood, with weekly meetings to take up the outstanding happenings in international affairs, national politics, literature, art, music, science and industry.

Regular attendance at, and active participation in, these meetings will prove to be an education in itself.

It will enlarge the mental horizon and broaden the moral sympathies. By disciplining the mind to active thought it will raise the level of workaday efficiency.

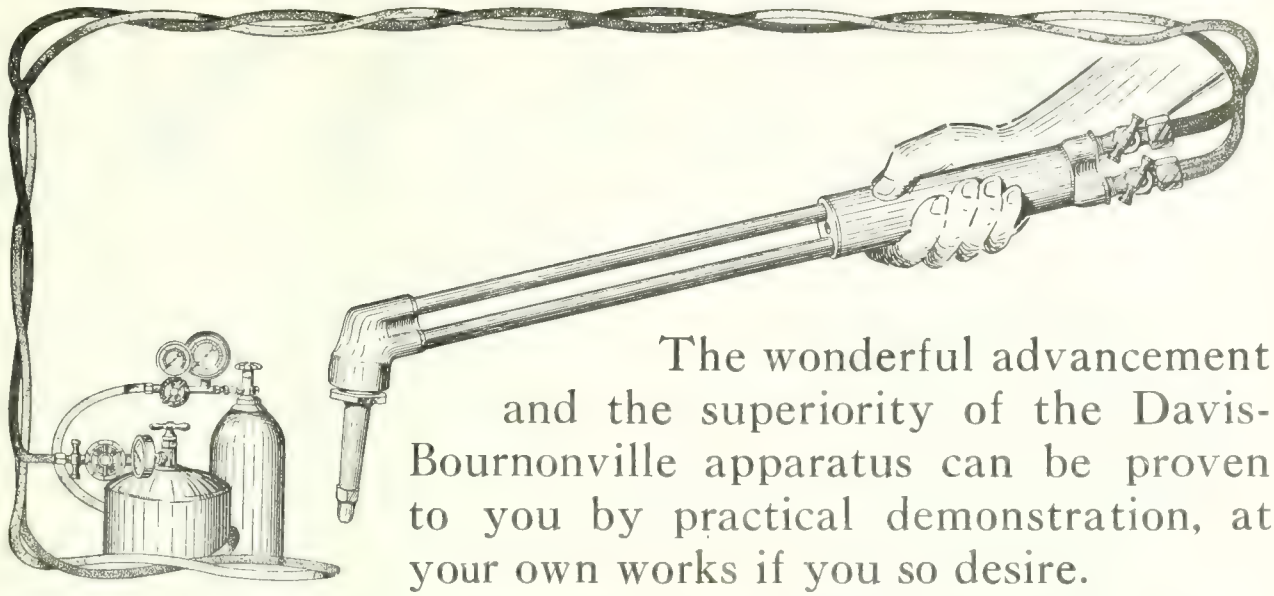
It will make for a more alert, a more conscientious citizenship. It will give zest and color to a life which perhaps has hitherto been pathetically drab.

Unsuspected powers will be awakened With a better grasp on the realities of life, the whole personality will expand.

One evening a week is certainly not too much to give to a discussion of the day-to-day developments in our wonderful world.

It may mean doing without an evening at cards or at the musical comedy, or at the dance hall. But this, after all, is not a terrible sacrifice.

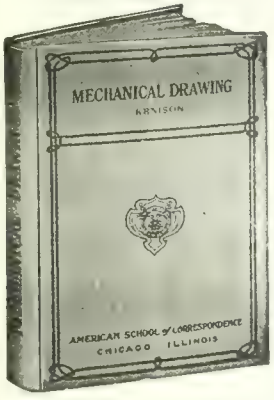
And from the occasional talk over current events will come more profit than could possibly come from any number of evenings spent in card-playing, dancing, or listening to musical comedies.—Reprinted from the Toronto Daily Star.



The wonderful advancement and the superiority of the Davis-Bournonville apparatus can be proven to you by practical demonstration, at your own works if you so desire.

Davis-Bournonville apparatus leads the world in range, efficiency, and number of plants in successful daily use. Write us for prices and demonstrations.

Carter Welding Co. of Toronto, Limited



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176 pp. 140 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates.

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MACLEAN'S

for DECEMBER

∴ ∴ MACLEAN'S MAGAZINE GETS BETTER ALL THE TIME ∴ ∴

Snipers and Sniping—*by a Sniper*

A SNIPER is back in Canada—a star sniper, who has 34 marks on his rifle, every mark meaning a German life. Most of us know absolutely nothing of the work of the sniper, but the story—a remarkable one—is told in the Christmas (December) MACLEAN'S by the champion sniper of the Canadian Expeditionary Forces. This man was buried by a shell-explosion, was dug out by two comrades, and he has lived to tell us his wonderful story, in MACLEAN'S. It's worth 15c to get this story alone.

"Politics From Within"

—Leacock, of Course

THIS [illegible] a chance for his witty and humorous pen. He deals with the humorous phases of electioneering in Canada in his usual vein.

Why Laurier sent Troops to South Africa

THIS contribution, by Col. John Bayne Maclean, goes backward many years—to the time of the South African War in 1899-1900. That was when Canada first took up arms for the Empire. Politics, of a high order, was back of the decision to send Canadian troops to the Antipodes. It is "inside" history.

Oppenheim—Allenson—McBeth—Mumford

A LONG instalment of **Oppenheim's** absorbing story, The Pawns Count, is given in the December MACLEAN'S. A short story, by A. C. Allenson is seasonable. Madge McBeth contributes a complete novelette, The Man Who Wasn't. And Ethel Watts Mumford, teller of delightful tales, delicately told, gives us the first of a series of short stories—Love and the Locksmith.

The Usual Popular Departments

THE Business Outlook, The Nation's Business, Women and Their Work, and the Review of Reviews—all are present in strong way in the December MACLEAN'S.

At All News-Stands 15c.

Gadsby's Story of the Union Government

GADSBY is saturated with Ottawa knowledge—much of it of the inside variety. He pokes about, talks with big men; and big men, and lesser ones, talk with Gadsby. Useful sort of man, is Gadsby. What he hears and learns he writes about for MACLEAN'S; and in this story of his about the new Union Government, he reveals the undercurrents on the movement that developed into negotiations, and which finally resulted in a Union Government. Gadsby adds interesting biographical information to his brilliant study.

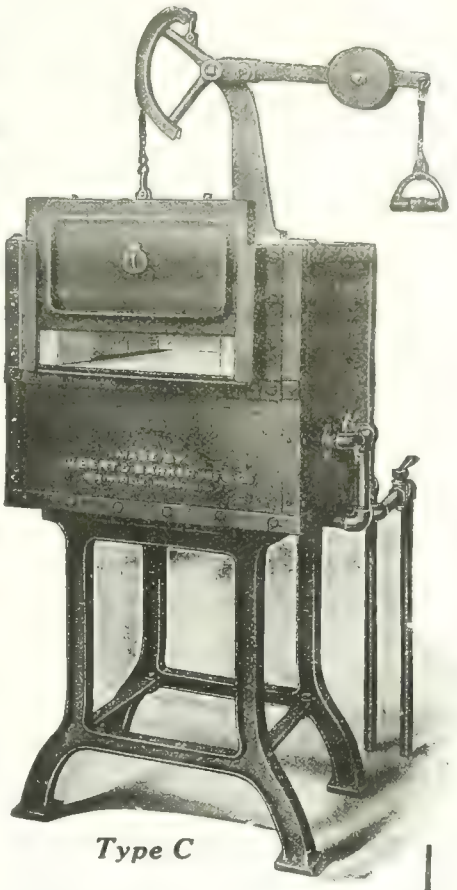
Robt. W. Service is back again

BACK in MACLEAN'S, that is—in body, he is still in Flanders—where the fighting grows uglier all the time. Service has taken time to write verse for MACLEAN'S. You know well the virility of his style, and the gripping, human character of his verse. It is about life and men in the trenches he writes—about our boys far from us. It is worth something to see our boys as Service sees them. Read "The Shape at the Wheel" in the December MACLEAN'S.

Arthur Stringer writes a Beautiful Christmas Poem

STRINGER is a wonderful man—wonderfully versatile, wonderfully human. He is a master of the short-story and of the detective and mystery type of story; and he can climb the heights of literary endeavor, as he has in this passing sweet poem—Christmas Bells in War-time. Your heart is tender these times of horrible slaughter and of heroic achievement, and you'll be grateful to Stringer for putting beautifully your innermost thoughts and feelings.

There is a half-century of experience back of every G. & B. Installation



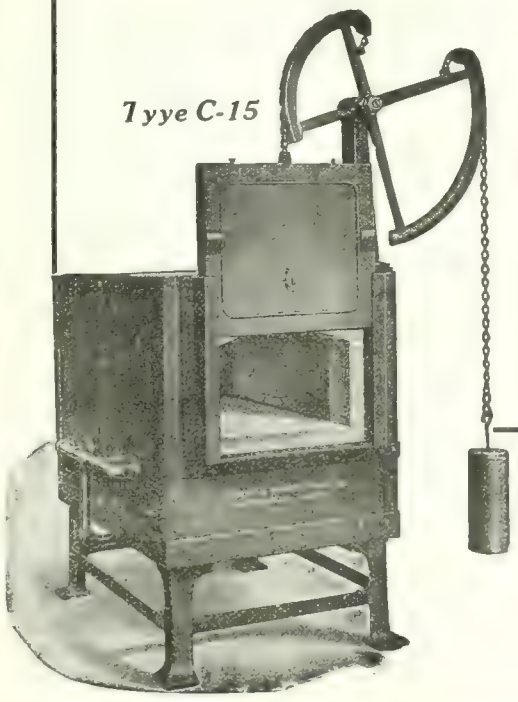
Type C

THE benefit of this long experience, which includes a thorough working knowledge of fuels, combustion and heat-treating methods is yours, whether you instal **one** Gilbert and Barker furnace or a **hundred.**

This should mean a great deal to you if you contemplate installing furnaces.

Gilbert and Barker furnaces are known for their dependability, wherever they are used. The experimental stage in their construction has been long passed. Year in and year out they give unequalled service to their users. It will pay you to investigate them. Our Engineering Department will gladly advise you.

We are now making delivery from stock on the smaller furnaces. All are made for either gas or oil fuel or can be furnished with combination gas or oil burners. Catalog 24 gives more details. You'll find it interesting.



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In Gilbert & Barker Furnaces, heat loss from radiation is cut down to the minimum. Heavy walls and the high quality of the fire brick used retain the maximum amount of heat.

Linings are made of the very best grade of Pennsylvania Fire Brick, Hard Baked.

None but the best grade materials used throughout.

Repairs, when necessary, are readily made without disturbing the general construction.

We make both Gas and Fuel Oil Burning Heat Treating Furnaces in more than 100 standard types.

These are some of the many good reasons why you should investigate. Get catalog 24 now.

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James De Von, 227 Davenport Road, Toronto, Ont.

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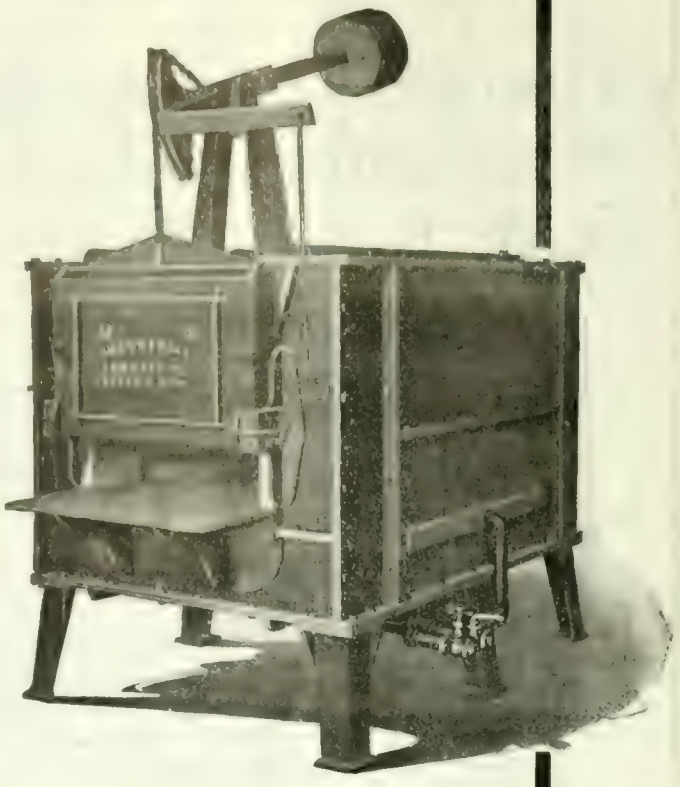
One of the 120

BELLEVUE FURNACES



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NEW HAVEN, CONN.
"CRAWFORD SECTIONAL" OVENS
Heated with our Enclosed Flame Gas Burners, or Electricity
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.
Ovens carried in stock and built to meet requirements of manufacturers.
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Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.
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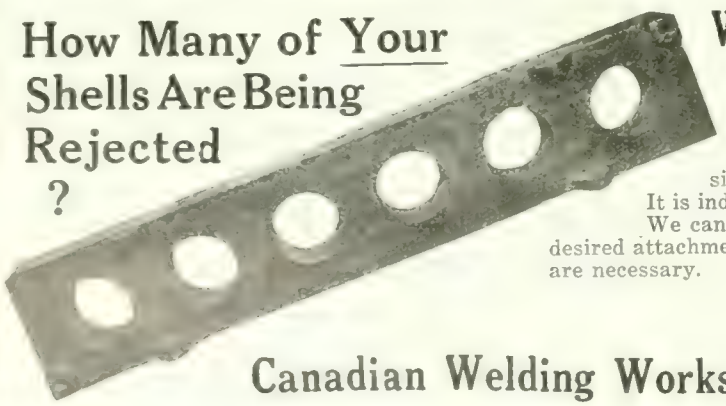
How Many of Your Shells Are Being Rejected ?



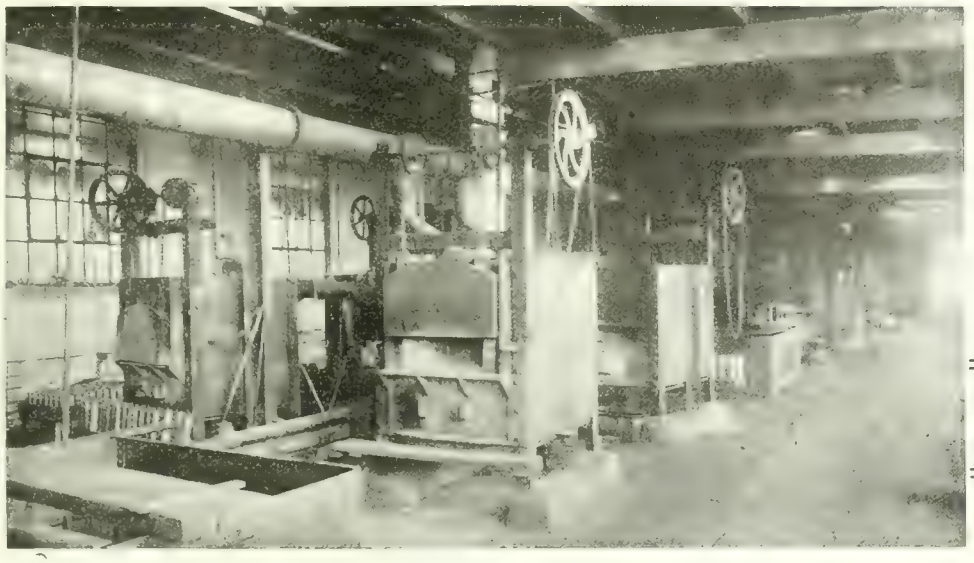
Water Jacket for Nosing Furnace

This STEEL jacket holds a large amount of water, which keeps the body of shell cold, and permits of proper heating of the nose for nosing operations. Being made of steel, it stands contraction and expansion—not possible with cast iron.
It is indestructible and fool-proof. Made for all sizes of shells. We can make this jacket to any special dimensions, with any desired attachments. No patterns are required—specifications all that are necessary.

Tested and Guaranteed.

IMMEDIATE DELIVERY.

Canadian Welding Works, Ltd., 51 Montfort Street **Montreal, P.Q.**



Annealing and Tempering Furnaces installed in the plant of the Canadian Vickers, Limited, Montreal.

"Mecol"

The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

Mechanical Engineering Co.
Limited
THREE RIVERS QUE. CANADA

HOSKINS
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THE
Efficient Heat-Treatment of Steel

Electric, Gas, and Oil Furnaces

CANADIAN HOSKINS, LIMITED
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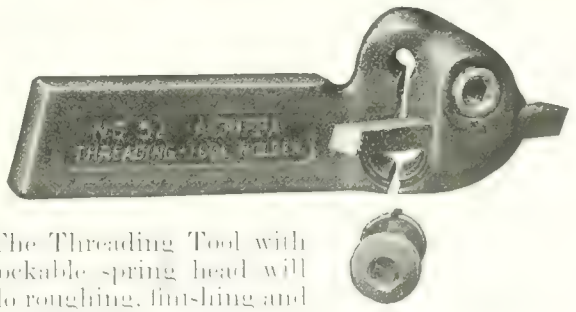
WILLIAMS'
"AGRIPPA"
Tool Holders

"THE HOLDERS THAT HOLD"



The Threading Tool with lockable spring head will do roughing, finishing and threading at one setting of the tool post.

J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
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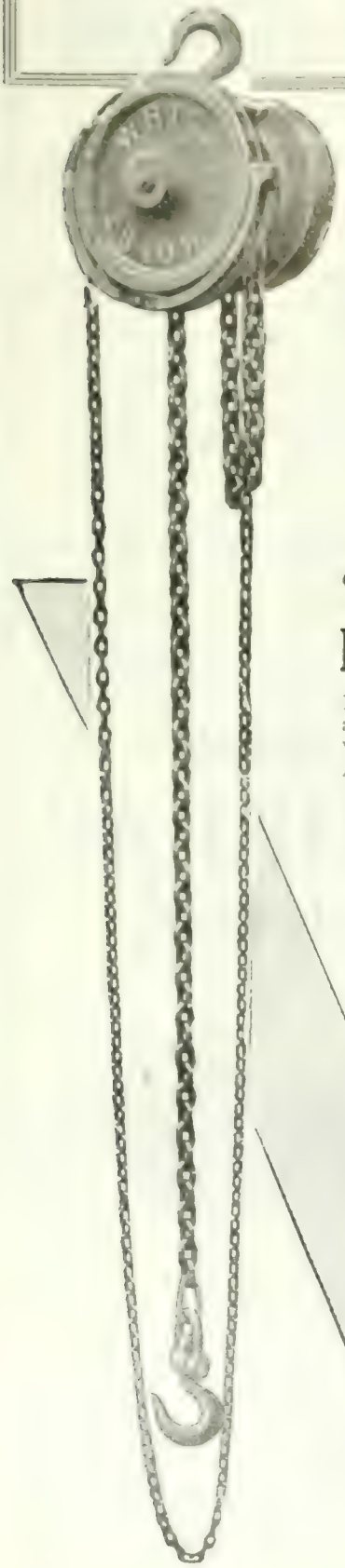
Outlast and Outlift Any Other Hoist



EVERY day Hoists are broken, materials and machines are damaged, time is wasted, money is lost, men are seriously injured—all because this or that man in charge did not know that **cast iron** for the working and load-lifting parts of a hoist is never reliable.

On the other hand, you probably know as well as we that the working and load-sustaining parts of a hoist must be **strongest malleable iron** and **strongest steel**—or danger is ever present.

Knowing this beforehand, to you doubly regretable would be a serious hoisting accident in your plant.

"Steel Hoists Never Break"

Ranging from 1 ton to 20, Wright Hoists are steel and malleable iron in every working and load-lifting part.

And the Wright Hand Chain pulled from any angle cannot foul or catch.

Do not pay Experience in money and regret for knowledge that is already yours. Instead, use Wright high-speed steel hoists that never break; that outlast and outlift any other hoist.

Write for catalogue to-day.

Wright Mfg. Co.
LISBON, OHIO

Canadian Agents:
A. R. Williams Machinery Co. Limited
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WRIGHT
High Speed Steel Hoists

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

Manufactured by

THE CANADA METAL CO., LTD.

Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

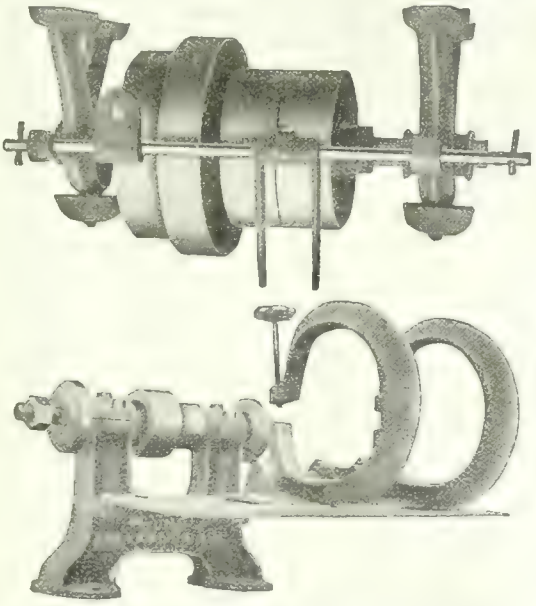
IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED

BOND ADJUSTABLE SKATE SHARPENER



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Babbitted and Reamed Bearings

Unnecessary to Remove Skates from Boots

Write for full information

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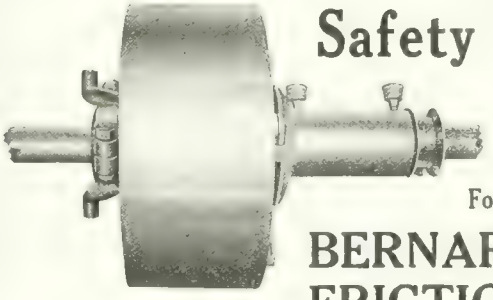


Safety First

A Principle That Applies Full Force to the

BERNARD FRICTIONAL CLUTCH

Discard dangerous clutches that are a constant danger to life and limb of the workmen engaged in their vicinity. A safe, simple and reliable substitute will be found in the Bernard Friction Clutch—use it and you will be applying the good axiom "Safety First" in your shop.

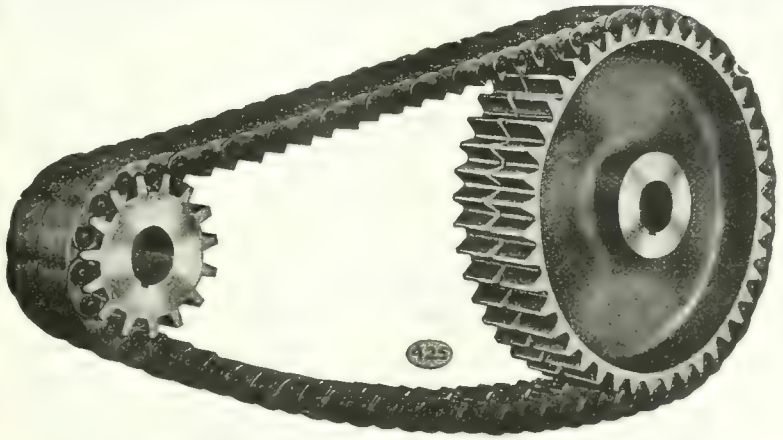
You can see by the illustration how completely the mechanism is made non-dangerous by the protecting cast shield. Accessible at side for adjusting. Can be used in combination with pulley sprocket or gears.

Write for full particulars.

The A. Bernard Industrial Co.

Manufacturers of High Grade Power Transmission Appliances

Office and Works: FORTIERVILLE, Que., Can.



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ENGINEERS

MONTREAL AND TORONTO

Specialists in

POWER TRANSMISSION CHAINS

CANADIAN AGENTS FOR

"RENOLD"

Patent Silent and Bush Roller Chains

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Rocker Joint Silent Chains

Chain Drives from ¼ H.P. to 5000 H.P. in successful operation

Write for particulars to

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STARRETT HACK SAWS CUT QUICKER LAST LONGER

In a shop such as this, the machinists use many Starrett Tools. With our reputation for fine precision tools, we could not muster up courage to put our name on a hack saw that is second to any obtainable. We know that

Starrett Hack Saws Are Unexcelled Just As Starrett Tools Are Unexcelled

We make them in our own shops, in the same plant with Starrett Tools. We know what steel they are made of. We know what they will do, for we test saws all the time under known conditions. With us it is test, test, test—to find out just what constitutes the best saw for this work or for that.

There is no question about the quality of Starrett Hack Saws. The only question is what numbered saw you should recommend, and this question is easily answered by referring to page 208 of our Catalog No. 21MA, which shows what saw to use for any particular work.

The L. S. Starrett Co.
The World's Greatest Toolmakers
ATHOL, MASS.
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42-748

STARRETT

Cut Quicker-Last Longer

"Pioneer"
STEEL HANGER
A Man's Job
Erecting cast-iron hangers is a man's job — and what is more, it doesn't take much of a hanger to require *two or three* men to get it into position.
A "Pioneer" Pressed Steel Hanger weighs only one-third as much as a cast-iron hanger; it has greater strength and costs no more; it can be erected by one man easily.
Why not, therefore, use "Pioneer" Hangers?
Have you a copy of our new booklet "Transmission Data"? It is worth studying. Mailed promptly for the asking.

Standard Pressed Steel Company

Philadelphia, Pa., U.S.A.

Sole Distributors for Ontario: H. W. Petrie, Ltd., Toronto, Ont.

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USED THE WORLD OVER

SATISFACTION

Atlas Babbitts

MADE IN CANADA

AMACOL
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TIN-TOUGHENED
W. E. W. BABBITT

These Babbitts are the result of years of experience and have a world-wide reputation for uniformity and reliability.

No Shock Too Severe No Load Too Heavy No Speed Too Great

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Made in all kinds of Metals, Rawhide and Fibre

SOCKET WHEELS
MADE TO ORDER

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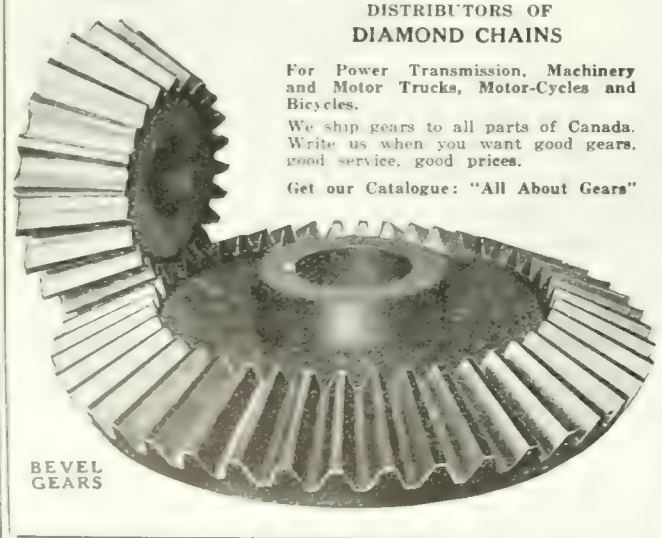
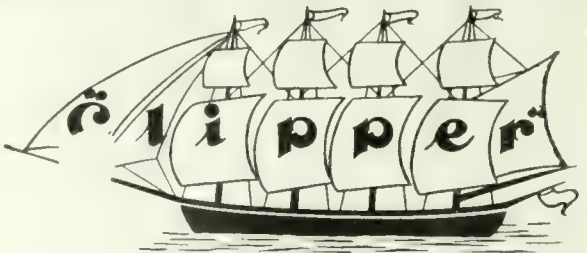
For Power Transmission, Machinery and Motor Trucks, Motor-Cycles and Bicycles.

We ship gears to all parts of Canada. Write us when you want good gears, good service, good prices.

Get our Catalogue: "All About Gears"



BEVEL GEARS



The Cost of Delay

IF a thing is worth having, it is worth having now. The present moment is worth more to all of us than all the to-morrows in the calendar.

Each day you put off sending for the "Clipper" Belt Lacer for 20 days' trial, you are running the risk of an expensive shut-down.

Three minutes is the maximum time required to lace a broken belt with the "Clipper" Belt Lacer.

Clipper Belt Lacer Company

976 Front Avenue Grand Rapids, Mich.

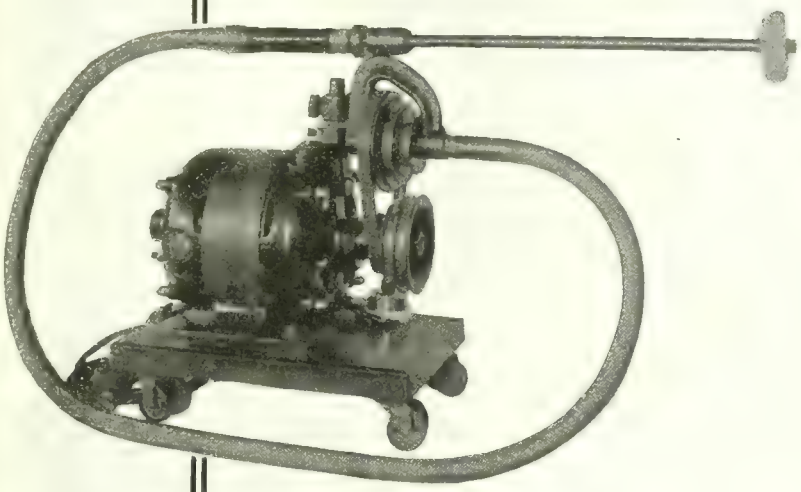
If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Clean Out Shells

Clean out the interior wall or base of any size shell and retouch the rough spots

with this

"STRAND"



Flexible Shaft Machine. Freely flexible to a certain radius, where it automatically forms a stop, it positively prevents accidental short bends. Shell factories throughout Canada use it with great success.

Three-speed countershaft and belts prevent overloading of the motor.

Simply remove the detachable handle and wheel, and drill chuck can be attached quickly and easily.

The Strand Flexible Shaft with metal casing outwears any other shaft and gives none of the trouble common to ordinary flexible shafts.

For light grinding, polishing, drilling—for cleaning out shells of all sizes—the Strand is the machine you need.

Drop a card for catalog to-day.

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401 New Birks Bldg., MONTREAL, QUE.
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Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

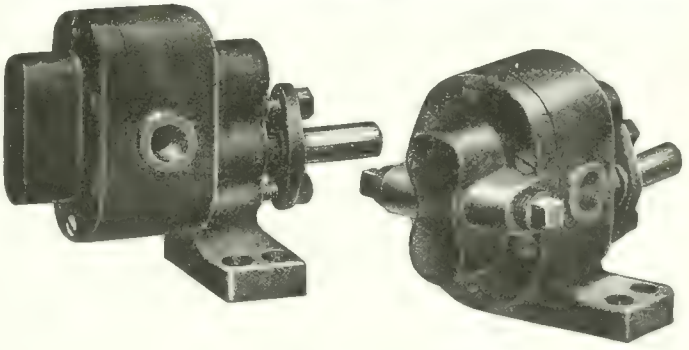
The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA

Wood or Steel, let Cummings make it.



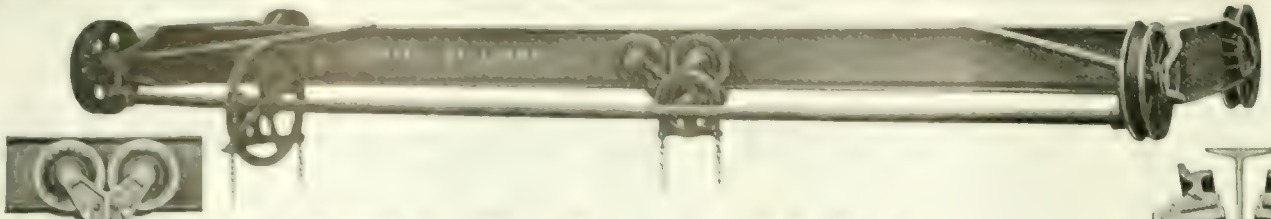
Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

If interested, tear out this page and keep with letters to be answered.



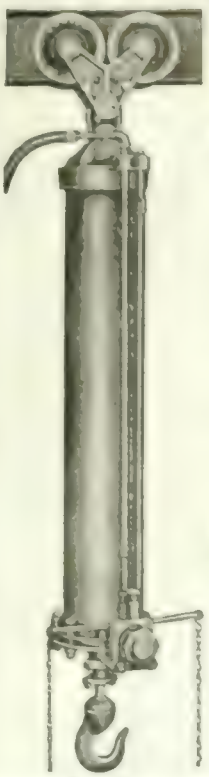
CURTIS, St. Louis, U.S.A.

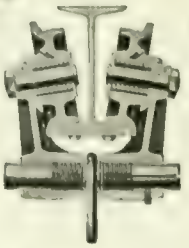
AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS — SAND BLASTS — PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS — JIB AND TRAVELING CRANES

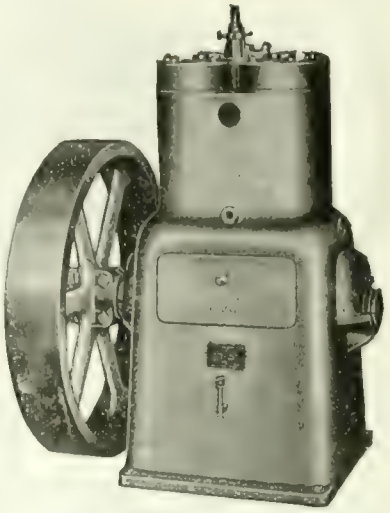
[illegible] years of pneumatic machinery. [illegible] the simple air cylinder into a straight line [illegible] with economy, speed, control and dependability capable [illegible] to hoisting problems.

Our new controlling splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor [illegible]

Complete catalogs and descriptive circulars on our entire line furnished on request







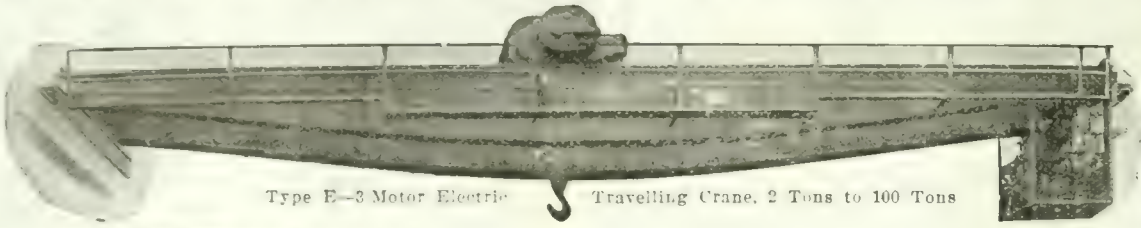
Curtis Pneumatic Machinery Co.

1585 Kienlen Avenue - St. Louis, U.S.A.
New York Office - 532F Hudson Terminal

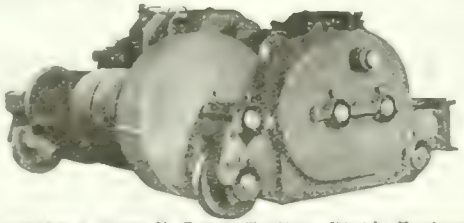
CANADIAN MADE

CANADIAN MADE

Electric and Hand Traveling Cranes

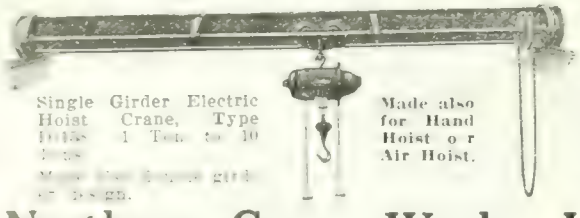


Type E—3 Motor Electric Travelling Crane, 2 Tons to 100 Tons



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type [illegible] 1 Ton to 10 Tons

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

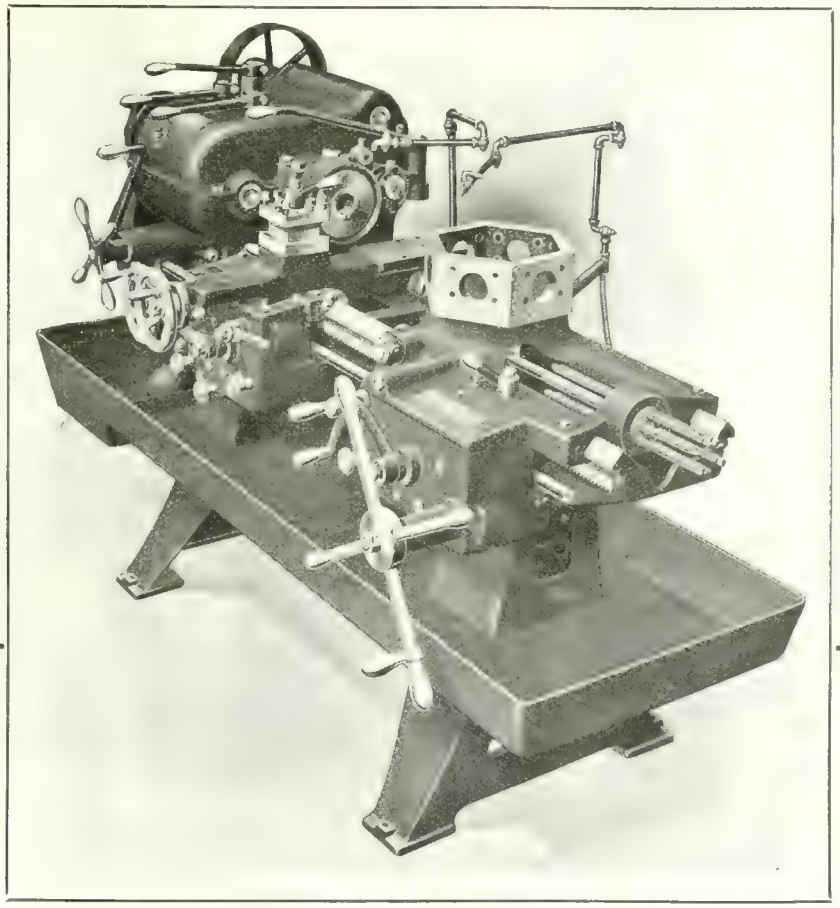
Type D Electric Hoists —½ to 10 Tons.

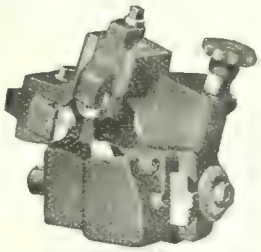
Air Hoists, Trolleys and Tracks.

Type No. 20 Air Hoist.

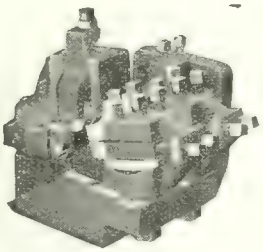
Northern Crane Works, Limited

Walkerville, Ontario, Canada





No. 138
Single Cutter Turner



No. 139
Multiple Cutter Turner

Bar Equipment

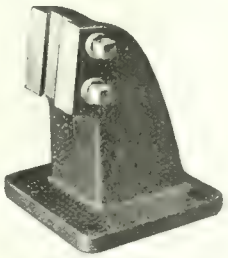
These are only four of the many standard tools that substantiate the claim of the designer that the 1-B Universal Turret Lathe is the biggest producer of bar work of its class and size.

Note the rigidity of the Single Cutter Turner, and in connection herewith consider the effect of rigidity on production, also the time-saving effected by the graduated dial in setting the tool.

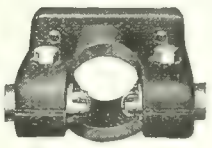
The Multiple Cutter Turner is the big time-saver on lighter work. As shown in the cut, it can carry four cutters and a drill for simultaneous operations, but on special order it can be equipped to carry six cutters and a drill, making seven cutting tools in all.

THE COMBINATION OF FOSTER MACHINE AND FOSTER TOOLS—MAXIMUM PRODUCTION.

Please note, however, that this applies to all of the general machines built by



No. 149
Rear Forming Tool Holder



No. 143
Knurling Tool

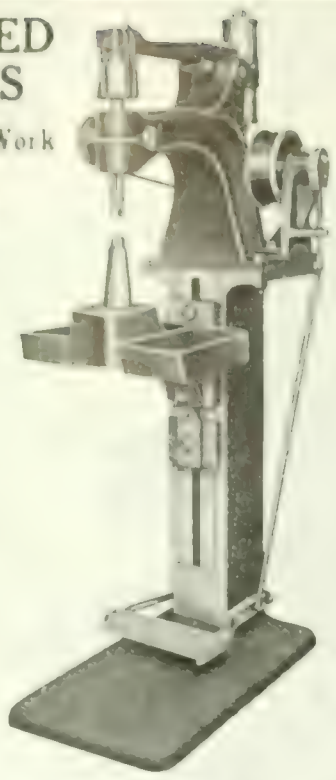
FOSTER MACHINE COMPANY

Elkhart, Indiana

HIGH SPEED HAMMERS

For High Speed Work

FEATURES:

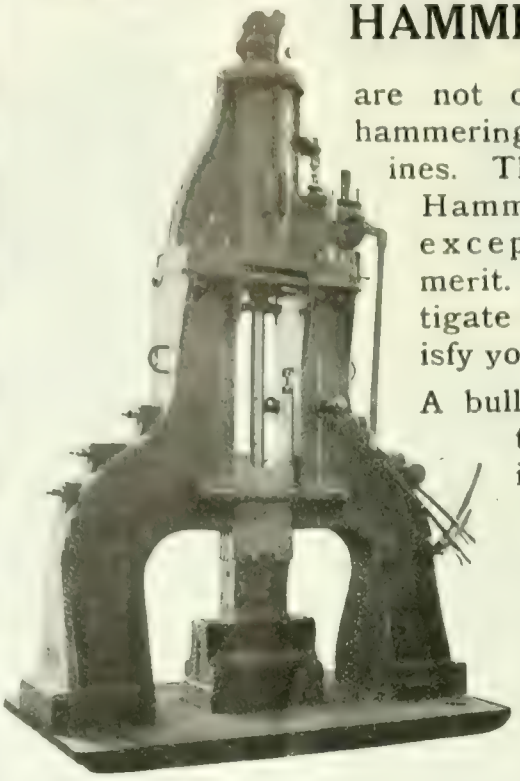


Send for our High Speed Hammer Book.

THE HIGH SPEED HAMMER CO.
Rochester, N.Y.

Sales Agents: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.

"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

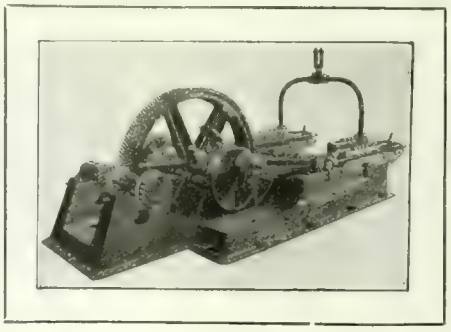
ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

SHEET METAL STAMPINGS

The quality of our production is one grade — THE BEST. Our facilities and equipment enable us to give a very attractive price and prompt service.

Dominion Forge and Stamping Co., Limited
WALKERVILLE, ONTARIO

DROP FORGINGS



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217½ No. Morgan Street CHICAGO, ILL.

Consolidated Presses

appeal to discriminating users because of the massive construction of all working parts, the generous crank shaft bearings, the increased diameter of crank pins, liberal crank cheeks, long and carefully fitted slide bearings, abnormally large connection screws, powerful gearing, and above all, the skill and care exercised in their construction.

These are features which should be considered when purchasing.

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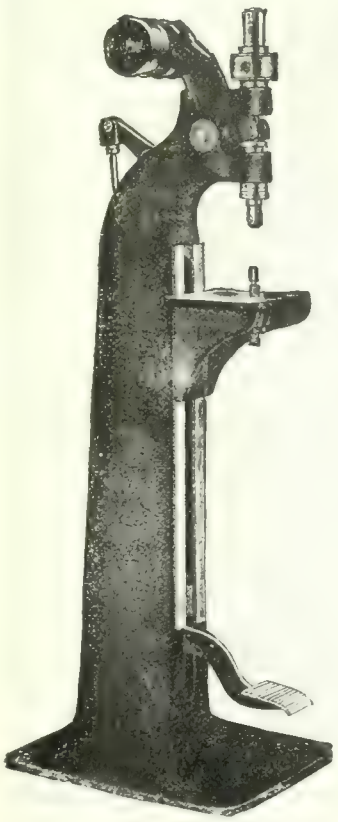
HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

Her Sure Touch



Her deep-rooted desire to do thoroughly whatever work is expected of her makes

WOMAN

ideally fitted for operating the Grant

Silent Riveter

Instead of nerve-racking, hammer-like blows; with this Grant Rotary Rivet Spinning Machine there is absolute quiet. Noiseless twin rolls, revolving independently of each other, roll heads on the rivets under pressure. One rivet every second, and never a bent shank, whether rivets are soft brass or hard steel. Heads finished perfectly smooth, show no mark of the riveting tool.

Thousands of articles now being riveted on Grant Noiseless Riveters. Write.

GRANT

Mfg. and Machine Co.

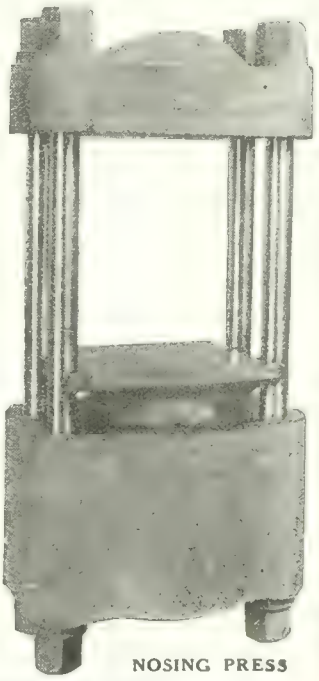
BRIDGEPORT, CONN., U.S.A.

PRESSES

Pumps and Accumulators

FOR ALL PURPOSES

Made in Canada



NOSING PRESS

WILLIAM R. PERRIN, Limited

TORONTO

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Bilton Gear Millers

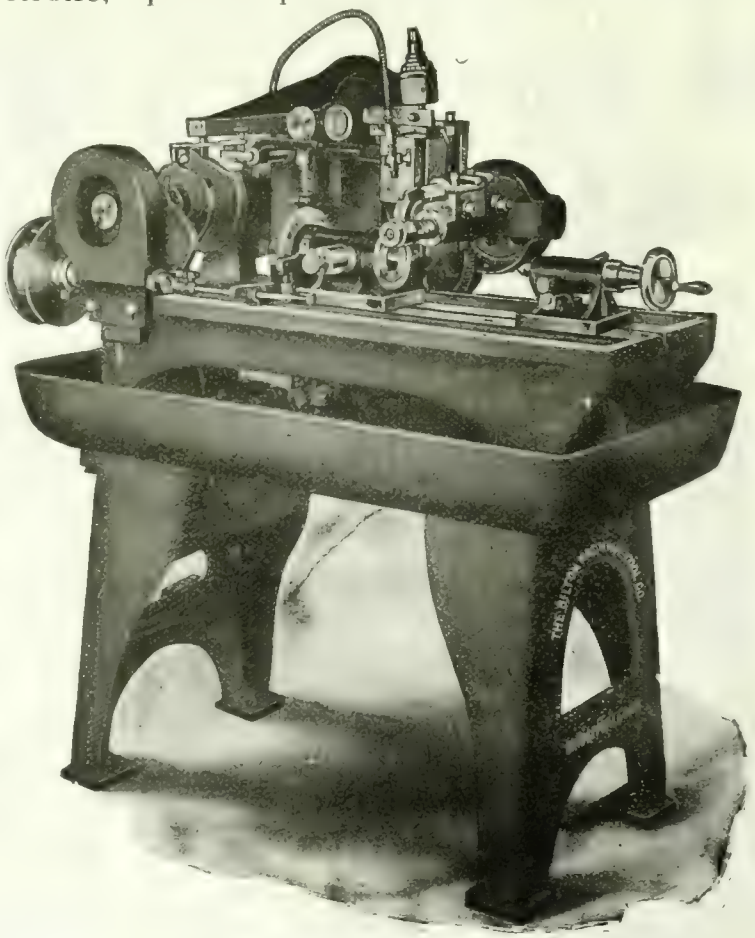
MACHINE TOOLS Bilton BRIDGEPORT

MACHINE TOOLS Bilton BRIDGEPORT

For your shop—if every working hour must deliver a predetermined quantity of output beyond the ordinary;
If the cutting of spur and bevel gears, taps and form work must be absolutely accurate.
In the never-varying service of Bilton Gear Millers you will realize satisfaction wholly unusual.
The cutter of a Bilton Gear Miller is actually removing metal 90% of the time. And while on its return stroke, lifted clear of the work, the indexing is done automatically.
Moreover, any angle from the horizontal to an angle of 90 degrees is accurately milled.
For *guaranteed* estimate of Bilton Gear Miller performance on your output, send us blue prints of your work. Or send a few blanks for us to finish, in which case we can show you the quality of Bilton work as well as positive proof of time saved.

Also Manufacturers of—
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Riveting Machines
Milling Cutters

Catalog 30 on request



The Bilton Machine Tool Co.

Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport
Conn., U.S.A.

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
Chas. Churchill Company, Limited

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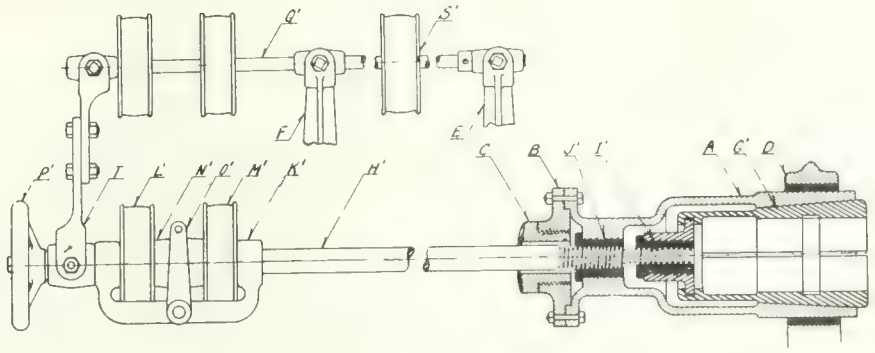


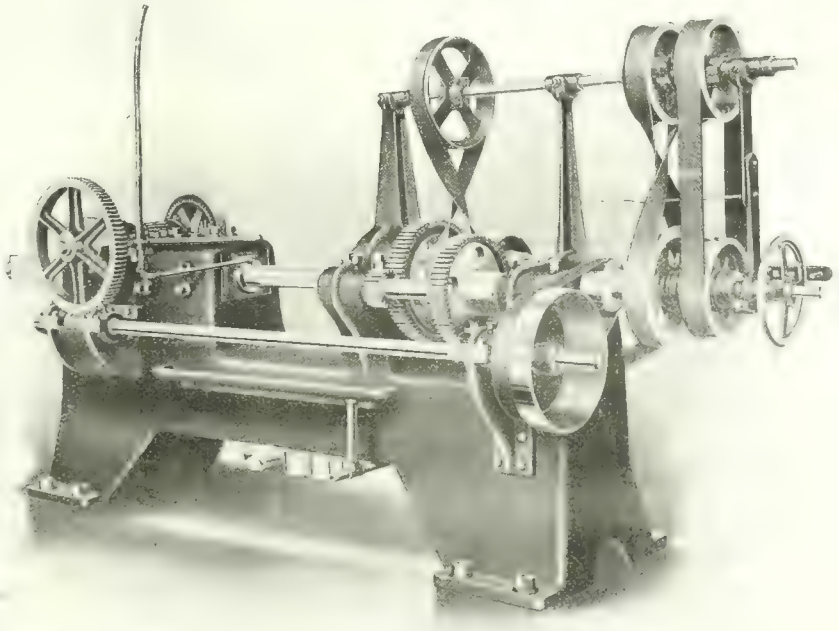
6" Boring — 75 Rough 100 Finish

10 HOUR DAY

A close study of the above chuck will reveal strength that enables this machine to give this production *all the time* in 10 hours. The illustration below shows the wonderful sturdiness of the machine. Inquire of us. The prices are exceptional. Made in Canada.

The Plessisville Foundry

PLESSISVILLE, QUEBEC



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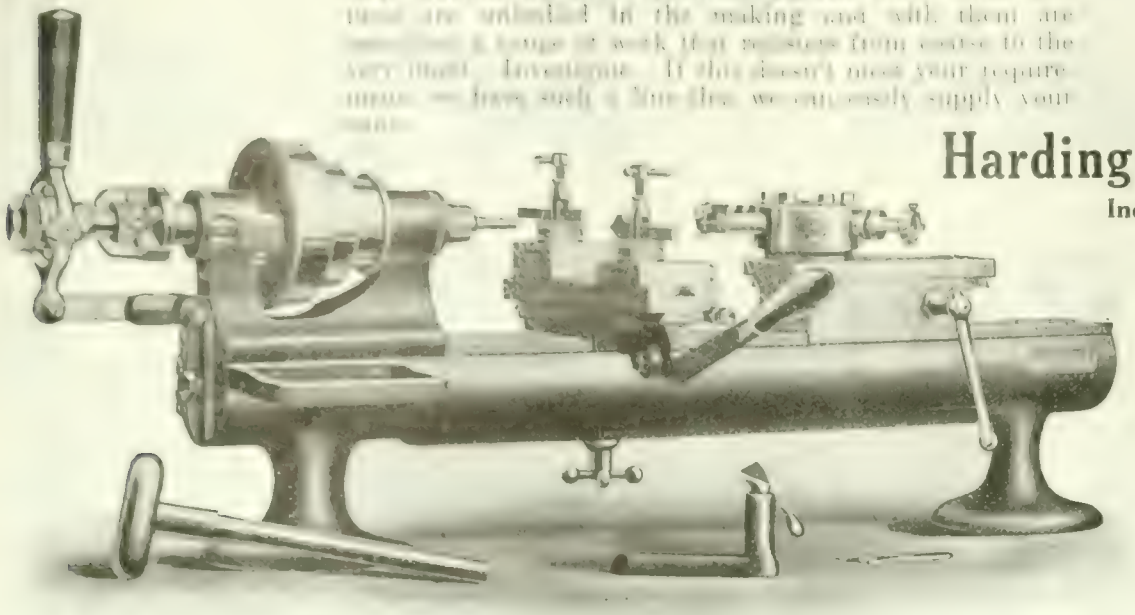
If it is a Question of Efficiency



Hardinge Bros.
Inc.
1770 Berteau Avenue,
CHICAGO
ILL., U.S.A.

Two Cuts at One Time

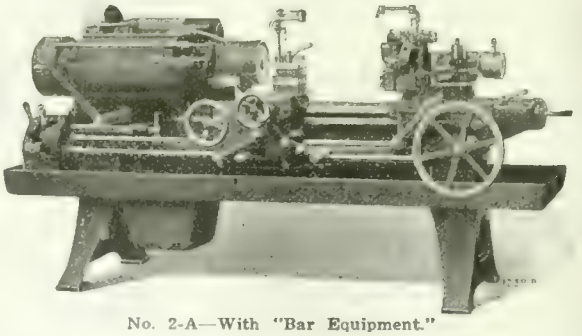
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

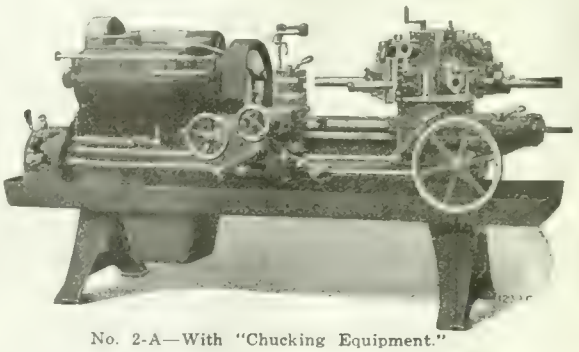
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

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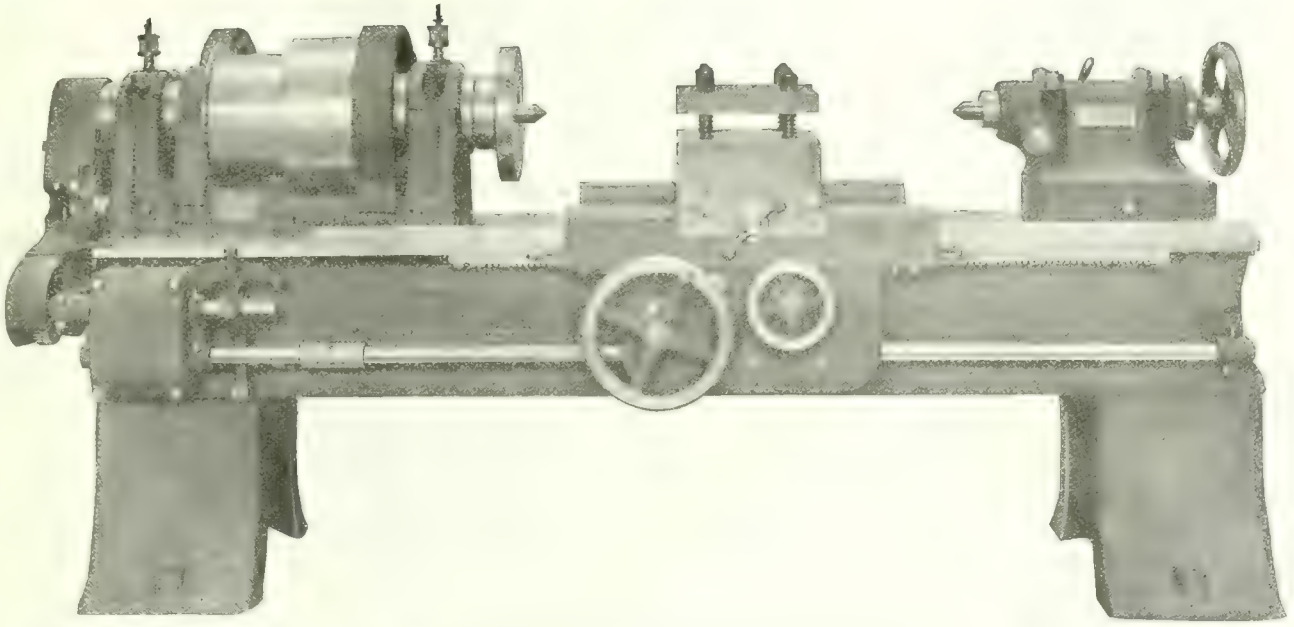
PETRIE Heavy Duty Manufacturing Lathe—*20-Inch Swing*



A Heavy Simplified Lathe for Rapid Production Work

Designed and built especially for Machining High Explosive and Shrapnel Shells up to and including 8-inch. Used and Endorsed by many of the Largest and Most Successful Shell Manufacturers.

DESCRIPTION

HEADSTOCK All Headstock journals are provided with well lubricated, renewable bronze bearings. Alternate heat treated steel and bronze washers take the end thrust and a simple adjustment is provided to take up wear. All gears are covered with neat and substantial cast iron guards that may be quickly removed when desired.

BED The Bed is of deep construction and width to give the greatest rigidity under heavy cuts. The shears are made extremely massive and the bed walls extra thick, providing the necessary mass of metal to absorb the vibration and shocks incident to heavy turning at high speeds. Heavy box girths tie the front and rear walls of the bed together at close intervals. Improved type wide angle V on front shear to take thrust of cutting tool. The rear bearing of carriage on bed is flat instead of V-shaped. At the rear of the bed planed pads are provided for attaching Taper and Forming Attachments.

CARRIAGE The bridge is very wide and extraordinarily deep; it will not spring under the heaviest cuts. The carriage is gibbed to the bed at the rear on the outside and will not lift under any conditions.

APRON The apron is of heavy double plate type affording a support or bearing to both ends of all shafts. Apron is tongued and grooved to the carriage, also bolted and dowelled. The feed friction has a greatly increased diameter and will pull the heaviest feeds and cuts without slipping. For engaging the friction a hand wheel several inches in diameter is provided and seats the friction firmly with very small effort on the part of the operator. All studs in apron revolve and simple but adequate oiling facilities are provided.

FEEDS Positive Gear drive through headstock spindle, steel gears in gear box, three rates of feed are provided for through sliding key type. Feeds per revolution of spindle being ⅛ in., 1-16 in. and 1-32 in. All gears in the feed train are fully guarded.

TAILSTOCK The tailstock is a massive casting, rigidly braced internally, and is provided with a long nose, making it unnecessary to extend the tailstock spindle for ordinary work. It is clamped to the bed by four large locking bolts operated at the top of the barrel. A simple binder locks the tailstock spindle in correct alignment; this clamp is located at the extreme front end, where it grips the spindle with the utmost rigidity and absolutely does away with distortion of any kind. The screw is unusually large to resist any buckling tendency. Suitable screws are provided for setting over for Taper Work.

EQUIPMENT Unless otherwise specified Lathes are furnished with 8 ft. bed, one driving plate, hand cross feed, heavy duty plain rest, necessary wrenches, and two-speed tight and loose countershaft. Forming attachment, turret tool post, hand or power feed bed turret, oil pan, pump, and connections can be furnished as extras when desired.

DIMENSIONS

Swing over bed	20	in.	Hole through spindle	1 5/16	in.
Swing over carriage	11	in.	Diameter Tailstock spindle	3⅜	in.
Length of Bed Standard	8	ft.	Travel of Tailstock spindle	6	in.
Distance between centres 8 ft. bed	40	in.	Morse Taper Centers	No. 5	
Width of bed overall	19½	in.	Width of Tool Slide	12	in.
Height from floor to centres	40	in.	Diameter of Headstock Cones	11 in. and 14	in.
Dimensions of front spindle bearing	4 15/16 in. x 6¾	in.	Belt Width	6	in.
Dimensions of rear spindle bearing	4 in. x 5½	in.	Number of Feed Changes	3	
Diameter Nose of spindle	4	in.	Feeds per Revolution of Spindle	⅛ in., 1 16 in., 1 32 in.	

Speed of Countershaft	110 R.P.M.
Size of Tight and Loose Pulleys	16 in. x 6¼ in.
Ratio of Back Gearing	6 2 to 1
Face of Back Gears	2¾ in. and 2¼ in.
Length of Carriage Bearing	30 in.
Width of Carriage Bridge	12 in.
Number of Spindle Speeds with Two-Speed Countershaft	
Weight Approximately	11 Bed 5300 lbs.

Immediate Deliveries. Telegraph or write for Prices and Further Particulars

H. W. PETRIE of Montreal, Ltd., Montreal, Que.

If any advertisement interests you, tear it out now and place with letters to be answered.

¼-in. Vertical Tapper

Without—Impossible!

Users pause to consider the increased speed, the better work, the fewer taps broken. Their conclusions, in sentiment, are at all times the same: "Without — impossible!"

Rickert-Shafer Tappers

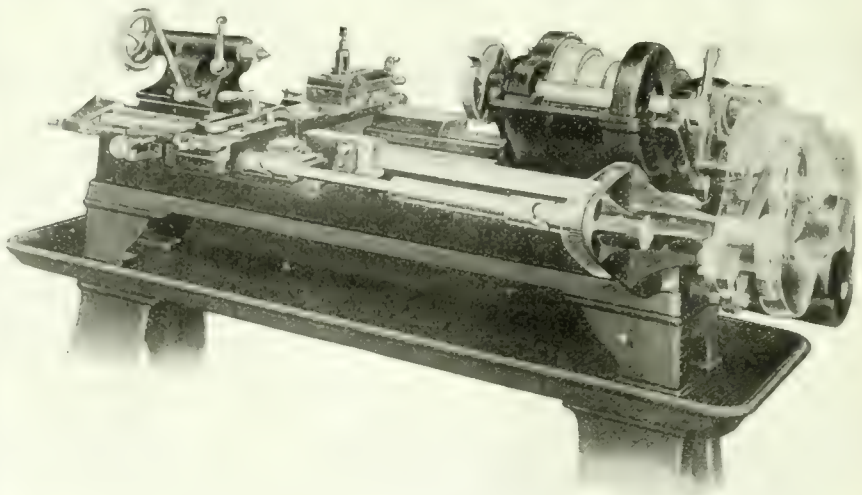
are doing work that hopelessly broke other tappers. Rickert-Shafer Tappers will do your work at a constant speed no other tapper can attain and hold. Rickert-Shafer Tappers behind your output will earn you many times their cost. *Write NOW for the reason-why details.*

Rickert-Shafer Company, Erie, Pa., U. S. A.

This is Our Address—How Can We Serve You?

Tool Room Precision

Nicest accuracy in the making of your tools is a road to profit that your better judgment will not overlook. It means speed in your shop as well as work far within a hair's breadth of absolute perfection.



Mulliner Quick Change Lathe

is guaranteed to bore and turn true within .001 inch. Still it is rugged enough to stand long and heavy strain. Its quick change mechanism provides 37 different threads and feeds. Accurately cut gears of special tumbler-gear design ensure smooth and quiet engagements.

Both front and rear journals are self-adjusting and also adjustable independent of each other.

The headstock spindle is special carbon hammered crucible steel.

Mulliner Lathe illustrated features the ring self-oiling system and is equipped with all tool-room attachments.

Write for additional facts.

Mulliner-Enlund Tool Co., Inc., Syracuse, N. Y.

Quebec Representatives, Foss & Hill Machinery Co., Montreal Ontario Representatives, H. W. Petrie, Ltd., Toronto

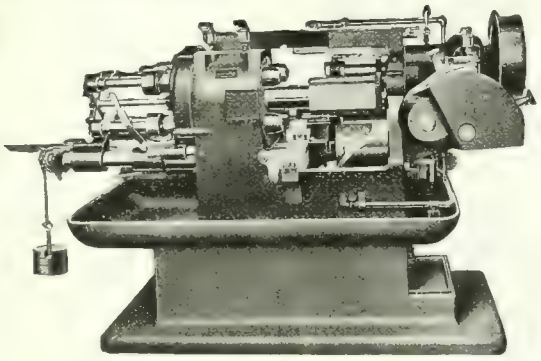
If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

MACHINE-POWER

AS AN AID TO MAN-POWER

is being used more and more as the labor shortage becomes acute and the demands for production greater.

The continued use of **GRIDLEY AUTOMATICS** has proved their value as modern machine tools which produce duplicate parts, up to 5" diameter, **rapidly, economically** and **accurately.**



They are meeting the test—greater production.

Our quotations on your blue prints or samples will show you how Gridleys can aid you.

GRIDLEY Multiple Spindle Automatic Screw Machines, capacities up to 2⅝" Chuck.

GRIDLEY Single Spindle Automatic Turret Lathe, capacities up to 5" chuck.

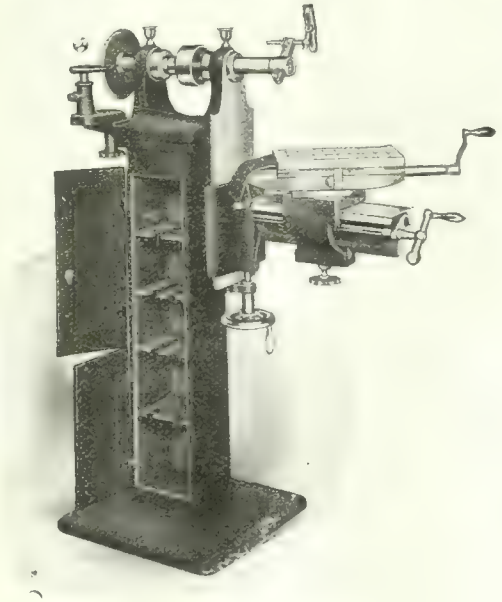
The National Acme Company, Cleveland, Ohio

New England Plant Windsor, Vermont BRANCH OFFICES: Canadian Plant Montreal, P.Q.

NEW YORK, BOSTON, CHICAGO, DETROIT, ATLANTA, SAN FRANCISCO. Representatives in Foreign Countries.

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies and Screw Machine Products at Cleveland, Ohio.

OBTAIN THE BEST RESULTS



GARVIN No. 3, Universal Cutter and Surface Grinder.
Use Code—Banish.

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14 in. x 6 in.; SURFACES, 9½ in. x 6 in.

For Further Information { *ASK YOUR DEALER or WRITE US DIRECT*

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

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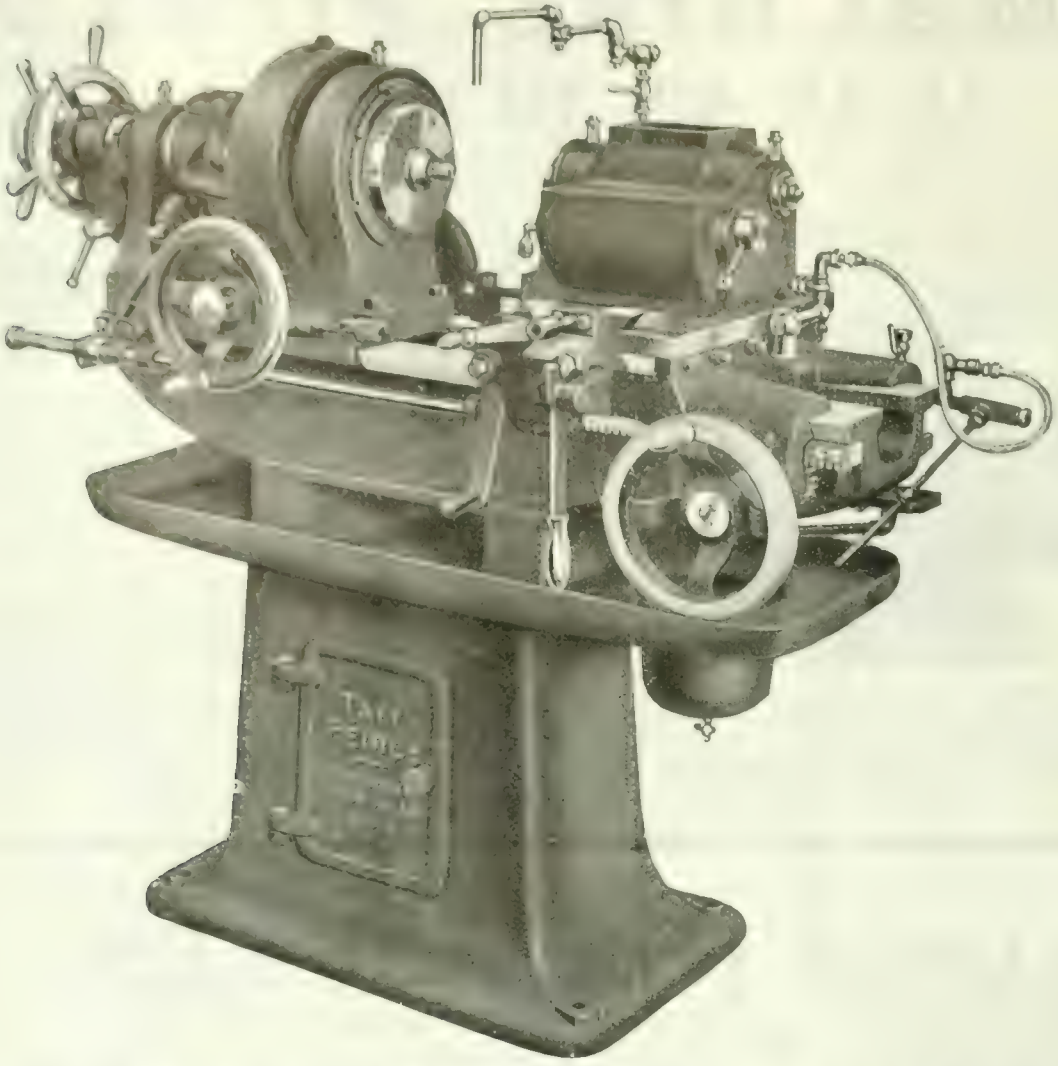
WE CAN NOW MAKE DELIVERIES



THE TAFT-PEIRCE THREAD MILLER

Completes a Thread in One Revolution

This machine is designed for threading operations where quality, accuracy and *speed* are essentials. It is strong, rigid, rapid and easily handled. The thread is milled with a multiple cutter the same length as the section to be threaded. Threads, external or internal, can be started at any predetermined point on the circumference of the work and completed at a single revolution of the work spindle. The Taft-Peirce Thread Miller is admirably adapted for threading rifle barrels and similar parts. One operator can attend two or more machines.

We shall be glad to show what the Taft-Peirce Thread Miller can do for you. Send us any piece or pieces on which you desire estimates. We can make deliveries promptly. Complete specifications, etc., sent on request.

TAFT-PEIRCE

Woonsocket, R.I., U.S.A.

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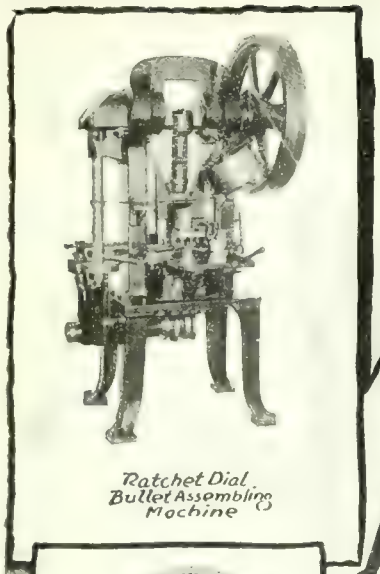
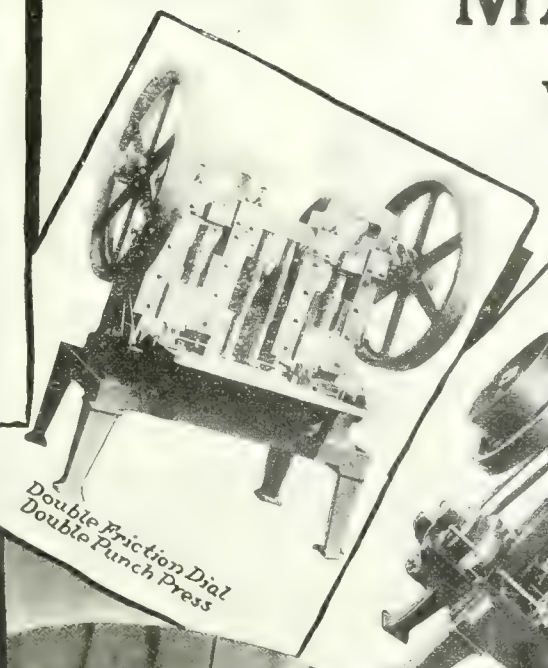
CARTRIDGE MACHINERY

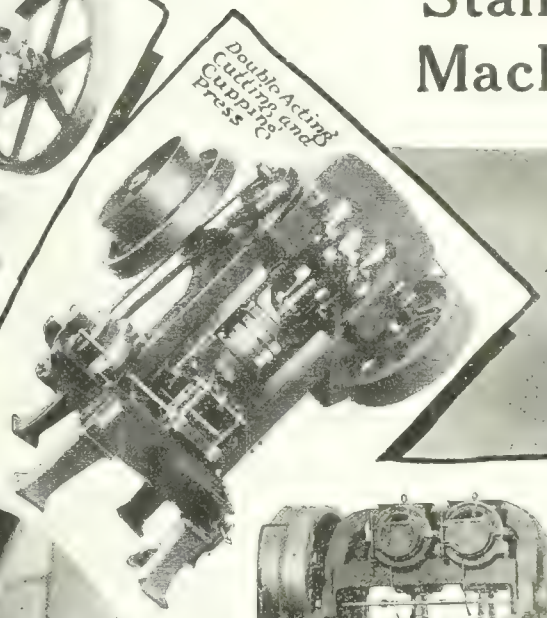
Waterbury Farrel Standard Machines



Ratchet Dial Bullet Assembling Machine



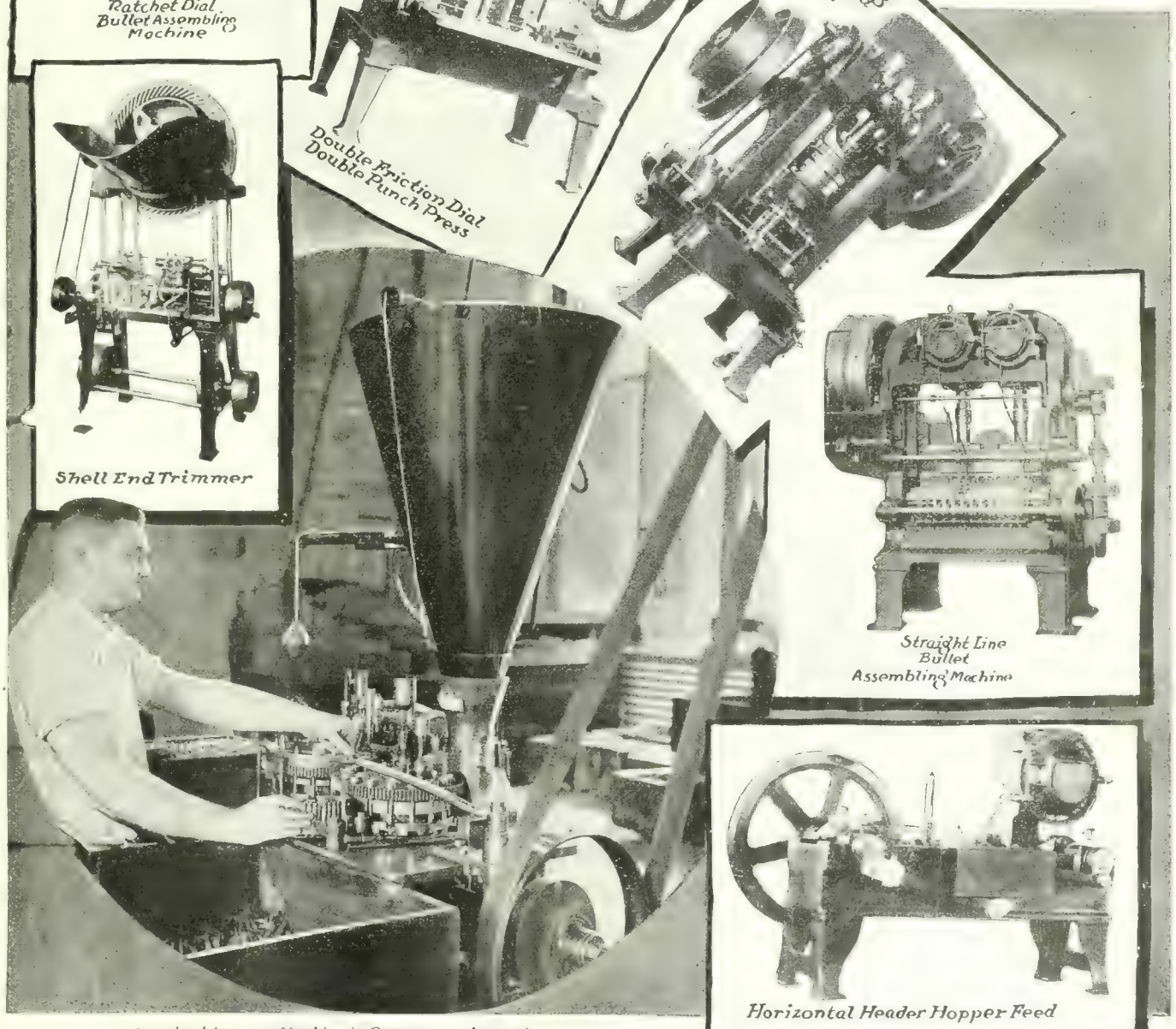
Double Friction Dial Double Punch Press



Double Acting Cutting and Cupping Press

Shell End Trimmer

Straight Line Bullet Assembling Machine



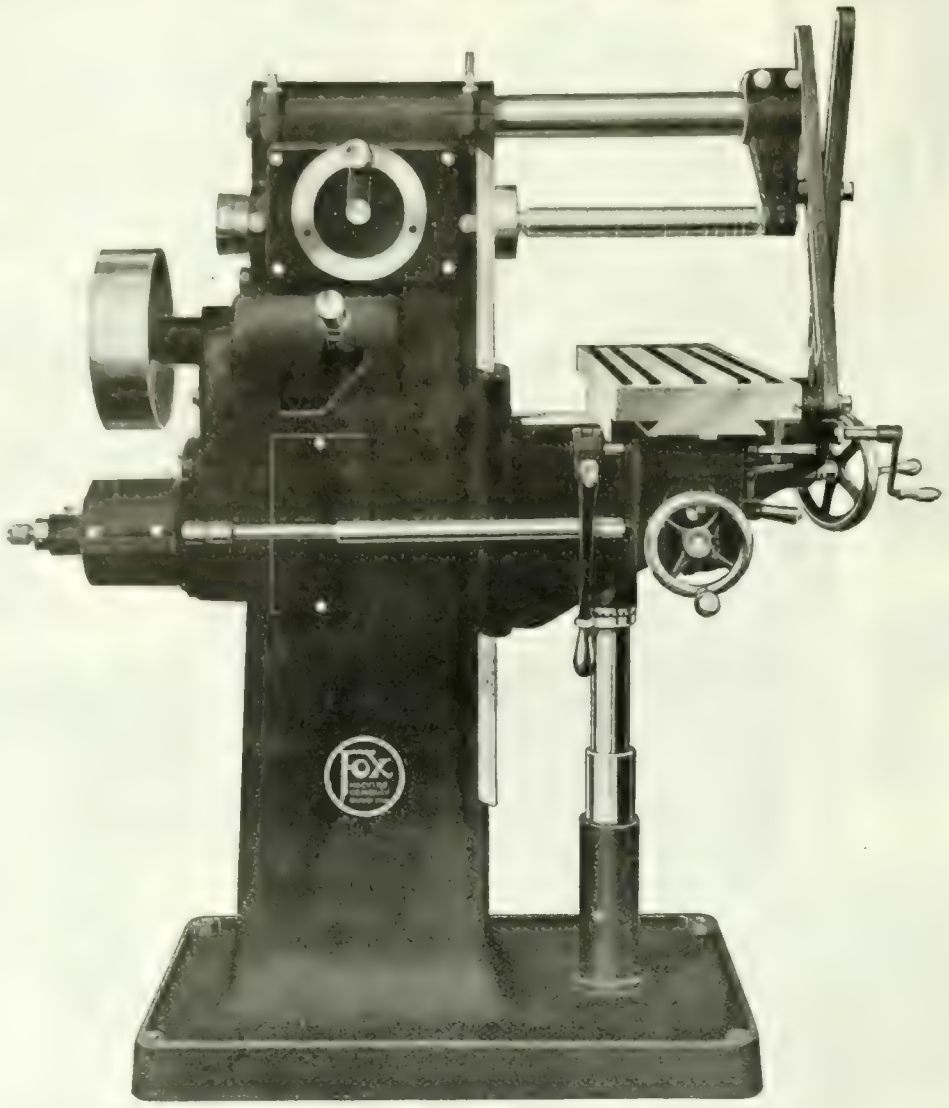
Standard Loading Machine in Government Arsenal

Horizontal Header Hopper Feed

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., U.S.A., has appointed me to be the sole manufacturer for export of their entire line of Cartridge and Shot Shell-Making Machinery. Proposals and Estimates covering complete plants or separate units, required for export will be furnished on request.

FREDERICK S. BLACKALL, Woolworth Tower, New York, U.S.A.

FOX



No. 2B PLAIN MILLER

Intensive Production requires machines of exceptional strength and durability. The 2-B Fox Plain Miller is a single pulley constant drive machine. Bronze bearings are used throughout, and hardened steel gears insure long life.

Table size	8½" x 37"	Longitudinal Movement	25½"
Vertical Movement	14½"	Taper in spindle	No. 9 B & S
Transverse Movement	8½"	Weight, net	1,075 lbs.

We build UNIVERSAL MILLERS, dividing heads, vises, MULTIPLE SPINDLE DRILLING MACHINES, Pipe Cutters and Wood Trimmers.

Write to-day for full information.

THE FOX MACHINE COMPANY

1047 West Ganson Street, JACKSON, MICH. *Formerly of* Grand Rapids, Mich.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Cincinnati Automatic Millers

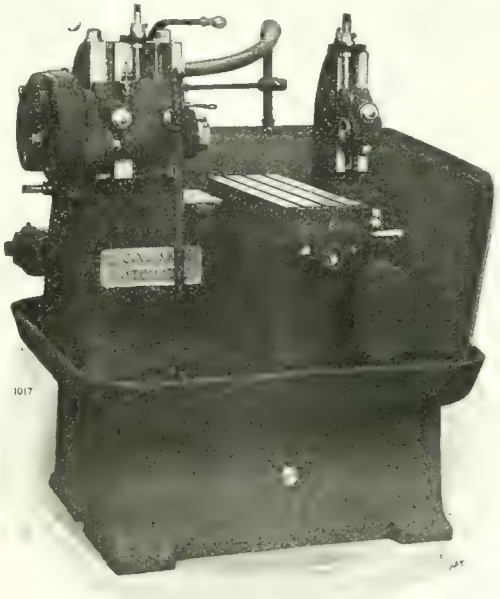
for Manufacturing

RIFLE AND MACHINE GUN COMPONENTS
and similar parts

The surface of the piece is absolutely unmarred. Because after the cut, the cutter is automatically brought to a standstill—the work returns under it while the spindle is stationary.

They have the intermittent feeding feature, which has proven so successful on our earlier machines, with this addition—after the cut is taken the spindle is stopped automatically so that the work returns beneath it while the cutter is stationary —no danger of marring the surface of the work because of a revolving cutter.

Consider too, the advantage of this from the standpoint of safety. The operator removes the finished piece and chucks a new one while the cutter is stationary. He can't get caught by a swiftly revolving although idle cutter. After he chucks the new piece, he moves one lever—and immediately both the spindle and feed movements start again.



This is one improvement on the Cincinnati Automatic. There are others equally vital. Do you wonder this new machine has already made a place for itself in the esteem of a number of big munitions shops?

For manufacturing parts in quantities it offers exceptional advantages.

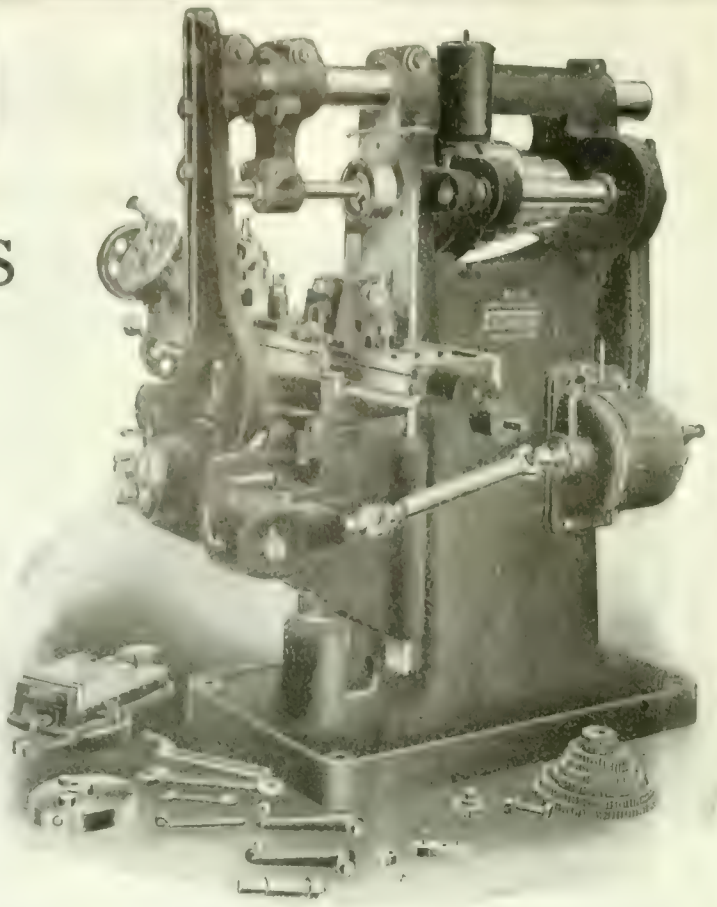
Bulletin containing details will be sent you upon request.

The Cincinnati Milling Machine Co.

CINCINNATI, OHIO

KEMPSMITH

UNIVERSAL MILLING MACHINES



Kempsmith Manufacturing Co.
MILWAUKEE, WIS., U.S.A.

AGENTS:
Foss & Hill Machinery Co., Montreal.
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CARTING A BARREL TO CARRY A CUPFUL

Digestedly, YES—if you are putting small work on a 300 lb. milling machine. It cannot do it profitably. Small work costs you to[illegible] much when o[illegible]

U.S. MILLER

[illegible] shop. A little machine of great strength and big capacity. It does quickly and accurately work that [illegible] miles of his shop.

WRITE FOR CATALOGUE.

United States Machine Tool Company
CINCINNATI, OHIO, U.S.A.

Sterling Engine Works

Successors to the
DOTY ENGINE WORKS

Expert Engineers, Machinists and Boiler Makers

Gasoline Engines, Steam Engines and Boilers, new and second-hand. Castings in iron or brass. Forgings. Machine and Boiler repairs. Cold Rolled Shaftings.

CUT GEARS

We have the only automatic Gear-Cutting Machine in Western Canada. We specialize in this work. Also in Marine and Hoisting Engines, Contractors' Equipment. Dredge Work, Dippers, etc.

Estimates gladly given on big or small orders.

Works and Office: Foot of Water Street
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WINNIPEG, MANITOBA

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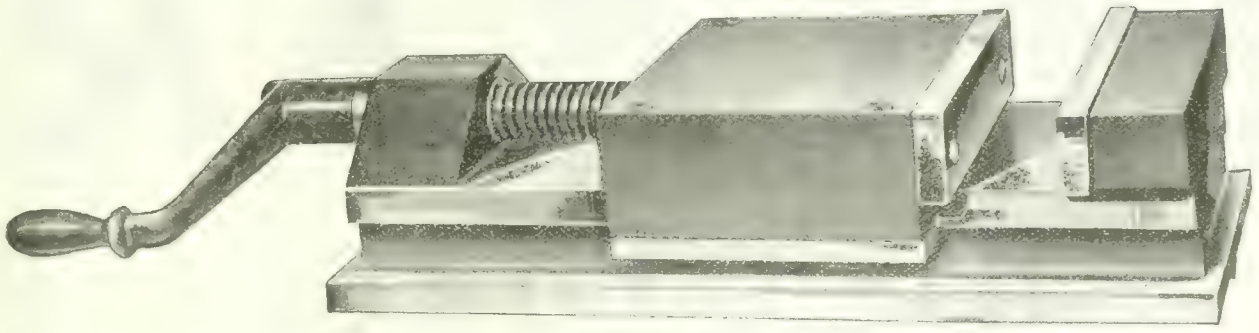
The Cleveland Milling Machine Co.

PLAIN VISE



HAS been designed with as much care and forethought as we have given our milling machines, cutters, and other products. There are good features in all vises, and bad features in some. When designing this vise, we took into consideration all the difficulties encountered, because of the shortcomings and faulty construction of vises which had come to our attention, and have endeavored, to the best of our ability, to eliminate these objectionable features.

It is a fact that the milling machine vise in many instances is expected to take the place of a jig, or fixture, and becomes quite an efficient addition to the milling machine, especially when used in pairs, so that one vise can be loaded or unloaded while the cutters are working on the piece, or pieces to be milled, in the other vise. Realizing this, we have made the tongue slot, on all vises, an exact distance from the face of the solid jaw. This feature is taken care of by efficient jigs for milling these slots.

All milling machine vises should be made as low as possible, without sacrificing strength and the facilities for clamping. This we have accomplished by having a cast, and machine finished flange on all four edges of the vise, thus allowing it to be clamped in any position on the table.

The jaws are of steel and can readily be removed for occasionally increasing the range, or inserting special jaws for holding pieces of irregular shape.

The ways of the vise are solid, giving the base greater strength, and the construction of block and gibbs such that they wipe the ways free of chips and foreign matter.

The movable jaw is made of ample thickness to allow for as large a diameter of screw as is consistent with the height of the vise. Tongue slots are milled at right angles to each other, so that the vise can be held parallel, or at right angles with the spindle.

It is also a fact that nearly all vises break diagonally from the corner of the solid jaw to the base, or on a diagonal line from the screw bearing to the base. We find that in casting these bases, this part of the vise has hitherto been solid, and has contained a larger amount of metal; the shrinkage, therefore, being greater at both ends, causes the metal there to be spongy and as this is where the greatest amount of stress comes, the castings usually break at these points. To overcome this trouble, we have set cores in both ends, as shown in sectional view below. These cores allow an even distribution of metal all around, eliminating shrinkage, and makes for stronger construction throughout.

The movable jaw is gibbed around the outside. This design eliminates the objectionable feature of having slots cut in the base of the vise for clamping the gibbs directly underneath. These gibbs, however, do not interfere in any way with the clamping of the vise onto the milling machine table.

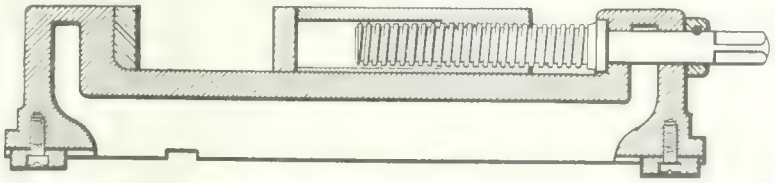
Depth of jaws, 1½".
Width of jaws, 6".
Open with steel jaws, 4⅜".
Open without steel jaws, 5⅜".

The regular equipment furnished with this vise is as follows:

One pair of clamps and bolts.
One crank handle.
Hardened and ground tongues.

Since the demand for this vise has been very great, we have arranged to keep them in stock, for immediate delivery.

PRICE ON APPLICATION



Cutters carried in stock by our agents:—

Dale-Brewster Machinery Company, Inc.,
547 W. Washington Bldg.,
Chicago, Ill.
New York Office, 30 Church Street, New York City.

and

D. Nast Machinery Company,
Bourse Bldg.,
Philadelphia, Pa.
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Baltimore, Md.

The Cleveland Milling Machine Co.

CLEVELAND, OHIO

Milling Cutters Milling Machines Relieving Machines

If any advertisement interests you, tear it out now and place with letters to be answered.

BECKER

High Power Vertical Miller

MODEL AB.

For high-speed work demanding great precision, this machine is earnestly recommended to you for the following reasons:

It has extraordinary rigidity.

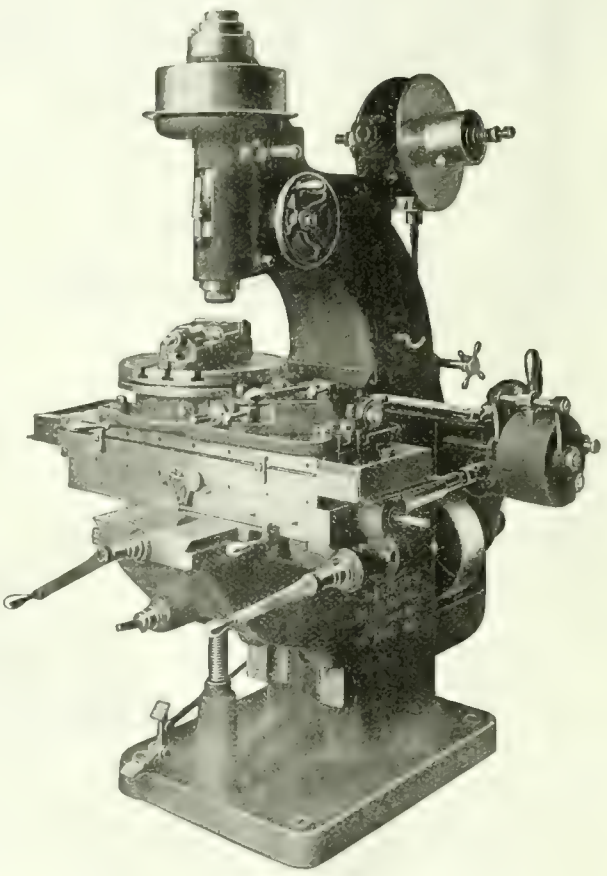
It requires 1/3 to 1/2 less power than other millers of corresponding sizes.

It has the famed Becker patented roller feed and positively non-slipping belt drive.

It holds an unbeaten record for output speed.

This excellent machine is offered for

Early Delivery



Write or Wire for Full Information to

Becker Milling Machine Co., HYDE PARK, BOSTON, MASS., U.S.A.

Gorton Cutting-Off Machine

Maintains a Feed of 1 Inch or More per Minute

Understand that it **maintains** this feed cutting the toughest stock. Ordinary stock it cuts at the great rate of 2″ feed per minute.

Any metal in round 1″ to 4½″, in squares 1″ to 3¼″, or in any other shape that comes within a 4½″ circle, it cuts day in and day out faster than any other machine. We can send you the names of largest rolling mills, locomotive works, navy yards and engine builders using our machines.

Gorton Cutting-off Machines, in material and workmanship, equal the finest built lathe or miller

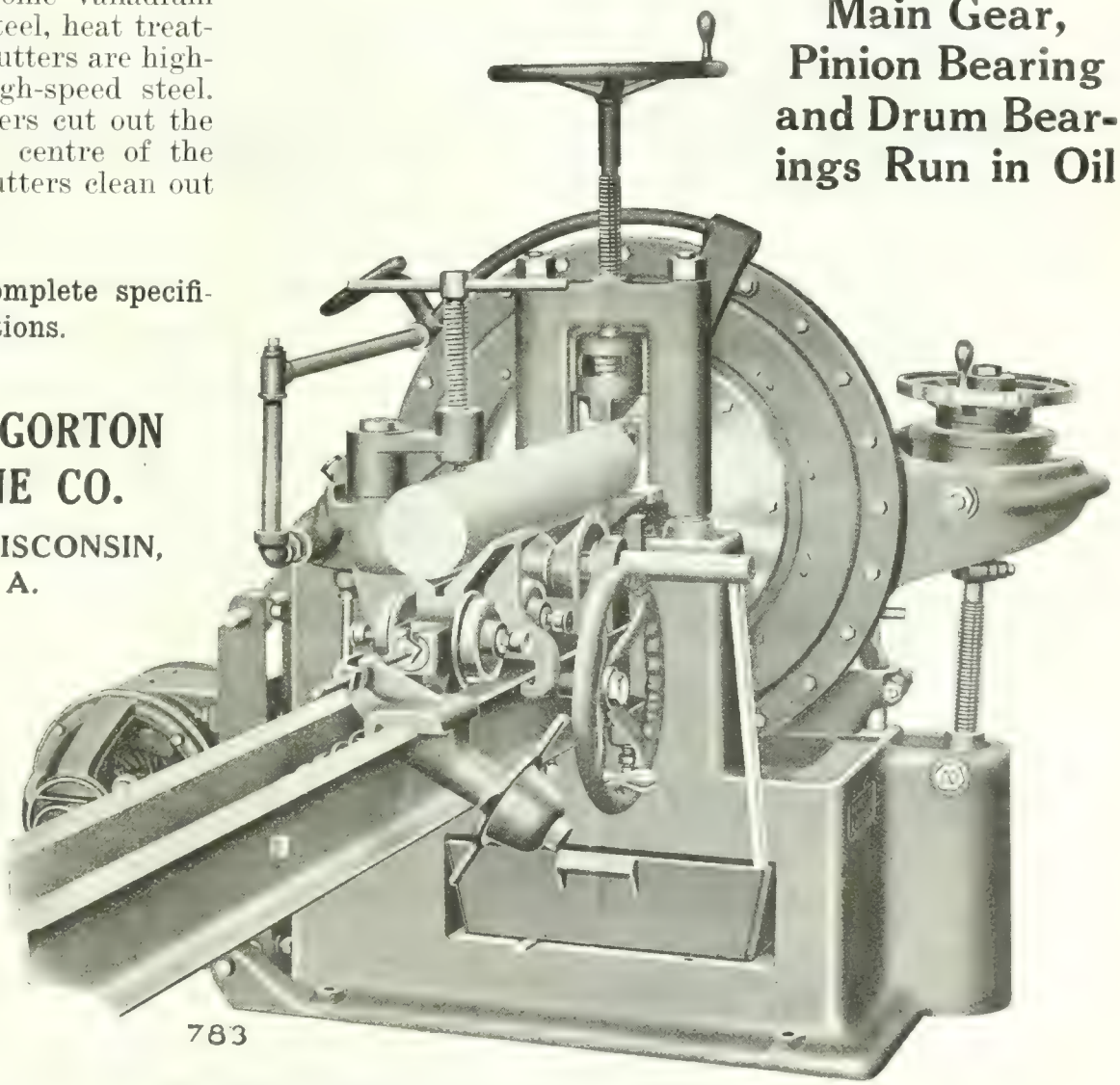
Blade is chrome vanadium manganese steel, heat treated. The 10 cutters are highest grade high-speed steel. Narrow Cutters cut out the metal in the centre of the cut; Wide Cutters clean out the corners.

Write for complete specifications.

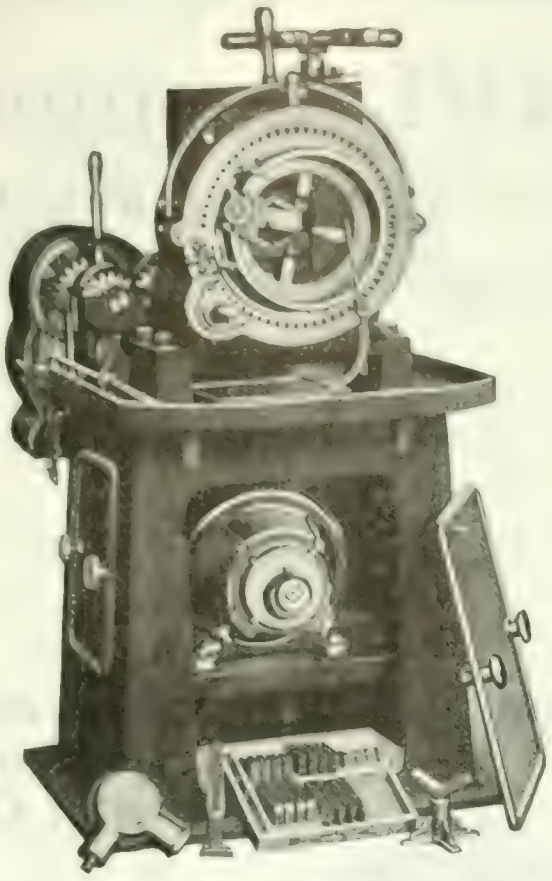
GEORGE GORTON MACHINE CO.

RACINE, WISCONSIN, U. S. A.

Main Gear, Pinion Bearing and Drum Bearings Run in Oil



FRONT VIEW OF GORTON No. 2-D HEAVY-DUTY CUTTING-OFF MACHINE



A Forbes Cuts Right

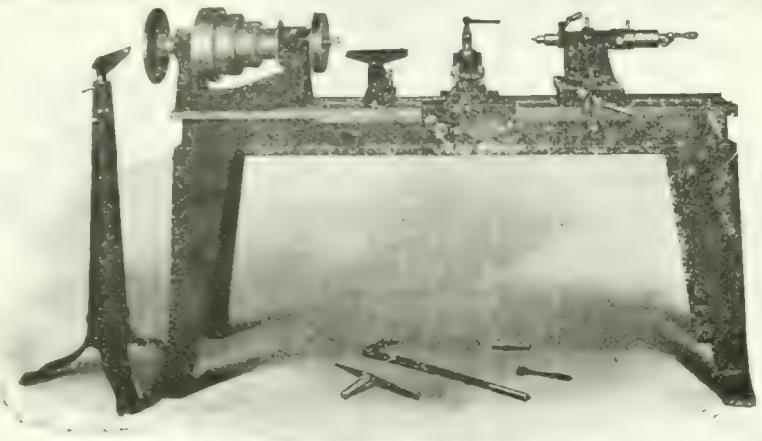
THREADS cut with a Forbes are threads cut right. If the class of work you are doing demands accuracy—and most work does—you need a Forbes.

It is the only machine on the market with receding gear which carries the dies on to the pipe. Instead of turning the heavy length of pipe in the dies, it turns the comparatively light dies around the pipe. The steel is adjustable to compensate for wear.

A powerful, compact machine—saves labor because it can be carried right to the job. Does away with the old stock and die method.

Further particulars should interest you. We will gladly send them.

The Curtis & Curtis Company
Garden Street, Bridgeport, Conn.



A Favorite---

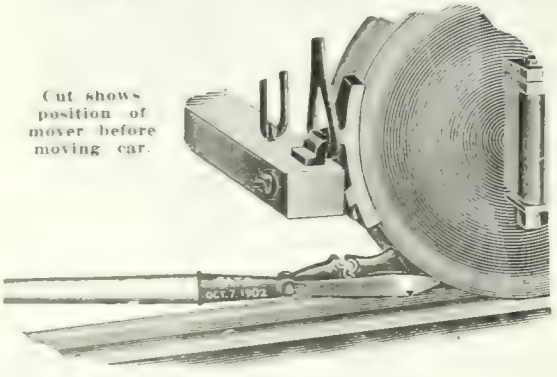
Blount Pattern-makers' Lathe

FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY
EVERETT, MASS, U.S.A.

THE "SAMSON" RAILWAY CAR MOVER



Cut shows position of mover before moving car.

Every railway siding should be supplied with one of these tools. Takes the place of fifteen men and puts the heaviest loaded car just where you want it. It will pay for itself in 30 days.

It is one of the most simple and powerful devices for moving cars by hand.

It is provided with Never-Slip Spurs, which is the most important feature on a Car Mover.

Special attention given to export orders.

Dillon Manufacturing Company

Oshawa, Ontario

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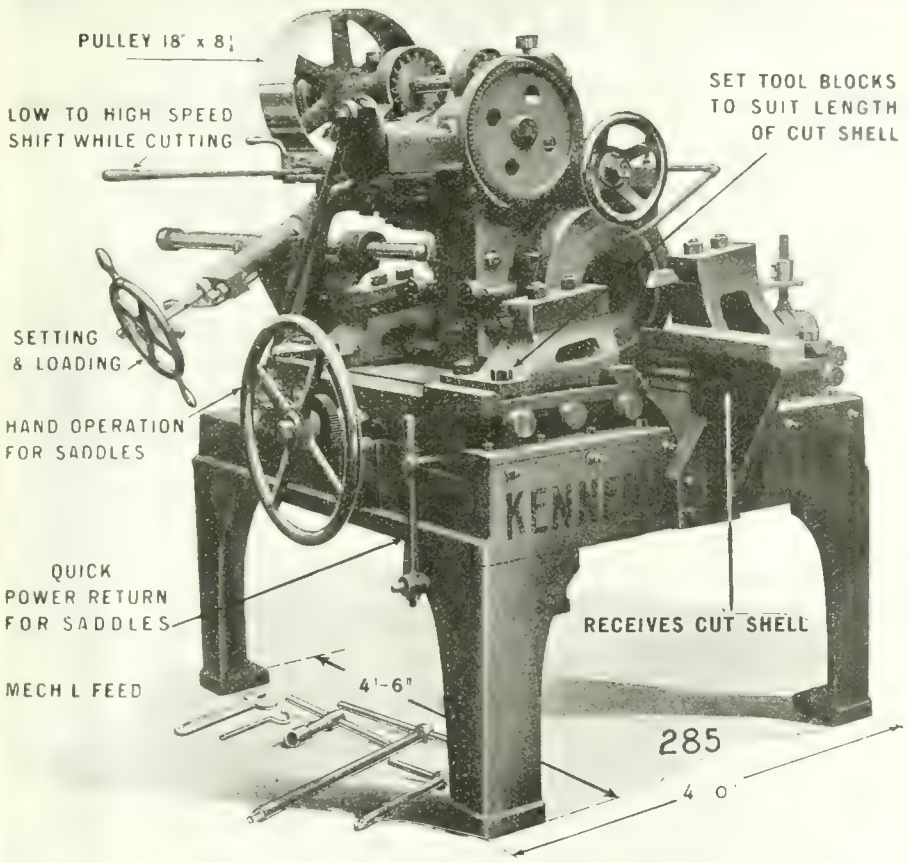


CUTTING-OFF MACHINES

Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

Forgings load in one end and discharge out the other when cut

A Girl can operate it

6—4.5" Machines in Stock

The
Wm. Kennedy & Sons,
Limited
Owen Sound

HALL

Pipe Threading Machinery
AND
Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½" to 8" inclusive.

The last word in Pipe Machine Construction

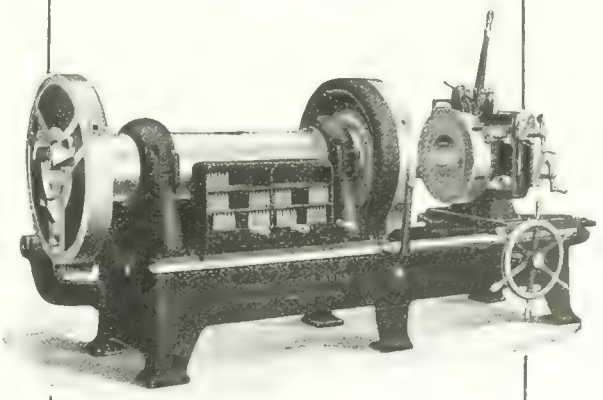
Let us give you full particulars of this machine which is only one of a large number having capacity ⅛" to 18" pipe.

Write us for catalog and prices on:

Pipe Threading Machines Nipple Threading Machines
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛" to 18".

John H. Hall & Sons, Ltd.
BRANTFORD, CANADA
EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

Made in Canada



Capacity
2½" to 8"
inclusive

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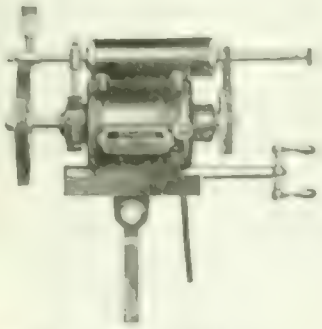
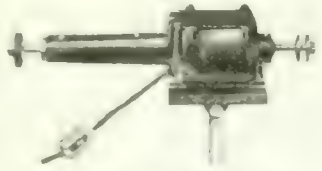
Equipment for the Standard Dumore Grinder



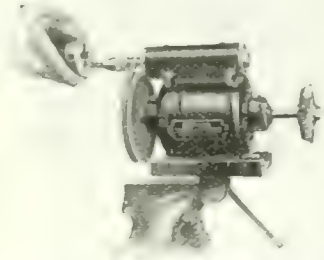
EQUIPMENT A

General Tool Room use. Includes high-speed internal spindle. Reach, 3 inches; speed, 30,000 R.P.M.; motor spindle speed, 10,000 R.P.M.



EQUIPMENT B

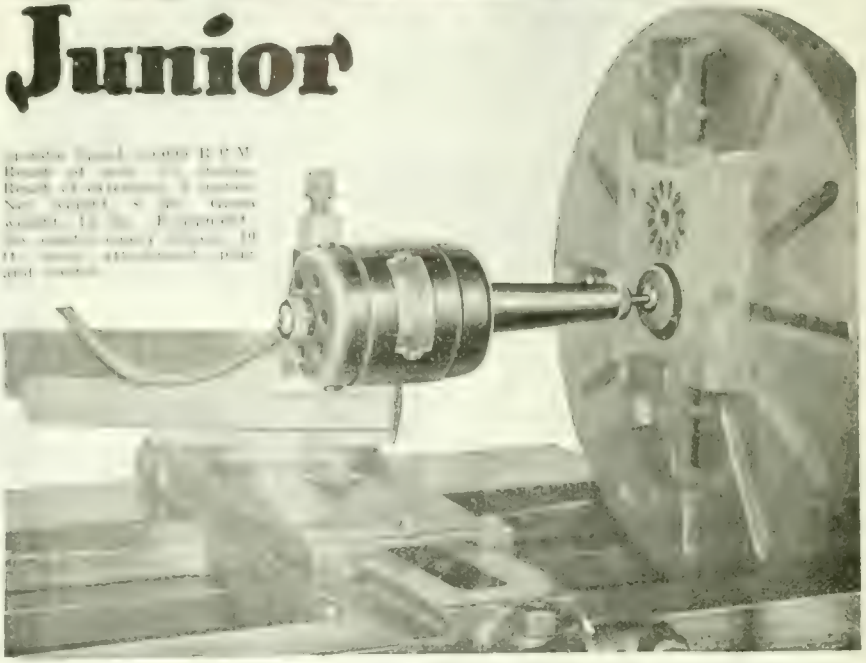
Deep Internal Work. 10-inch extension arm. Speed, 10,000 R.P.M.



EQUIPMENT C

Button Die Grinder. Speed, 50,000 R.P.M.

Another Dumore Grinder — The Dumore Junior



The Dumore Junior Grinder has been designed to meet the requirements of the manufacturer who desires a light grinder which will do accurate work, yet who does not wish to invest in a larger and more expensive tool. Invaluable for the accurate grinding of tools, dies and gages—can be quickly attached to lathes or other machine shop equipments. The

DUMORE JUNIOR. PORTABLE ELECTRIC GRINDER

is built in the same conscientious manner, and embodies the same special features as the larger Dumore Grinders. The armature is dynamically balanced, and the spindle operates at 20,000 R.P.M. Friction is reduced to minimum by using high-grade Ball Bearings. This scientific construction has entirely eliminated vibration, and any work ground with the Dumore Junior will be found accurate and free from chatter marks.

Like all other Dumore products, this new grinder is sold on its merits. Write to-day for descriptive literature.

Wisconsin Electric Co., 1717 Dumore Bldg., RACINE, WIS.

Sold in England by Canadian-American Machinery Co., Limited, 8 Bouverie St., London, E.C., England

We are not Playing Checkers

Every man-jack of us at the Carborundum plant is working like the proverbial beaver, for never before has there been such a demand for Carborundum and Aloxite Products.
We are doing our level best to meet this big demand—enlarging our plants, increasing our forces, speeding up production—we are even building a big 20,000 horse power furnace plant in Canada in our efforts to keep up with things. We have a definite service to perform for we are helping to produce the necessities of war.

Carborundum and Aloxite Products are Doing Their Bit

They are grinding shrapnel shells, high-explosive shells, rifle barrels and parts—grinding bayonets and sabers. They are grinding a hundred and one different parts of the aeroplane and the auto truck, the machine gun and the field gun. They are shaping armor plate and grinding car wheels; grinding plowshares, and the tools of the metal-working trades of the world. They are grinding torpedo tubes and torpedoes, grinding submarine engine bases; beveling the lenses of periscopes and buffing the soles of the army shoes and grinding the shears for the pocket kits of the "Sammies." They are doing a thousand and one war tasks quicker and better than they have ever been done before.

Carborundum and Aloxite products are surely doing their bit, but with it all we haven't neglected for one instant our regular patrons—we are doing all in our power to keep up with the pace; to keep up to the standards of Carborundum service.

THE CARBORUNDUM COMPANY
NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI
MILWAUKEE PITTSBURGH GRAND RAPIDS

Watch a Capable Mechanic Test a File—

See him pass his thumb over the teeth.

By instinct, he knows, at once, whether a file will do its work.

He senses, at once, the quality of the steel—its balance—and the sharp-edged teeth.

He makes no mistakes in buying—and his choice every time will be for "Famous Five" Files.

Be influenced by *his* judgment and specify "Famous Five" Files when ordering.

They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by

NICHOLSON FILE CO.
PORT HOPE
ONTARIO

WE BUILD THEM BY HUNDREDS

Standardized Production enables us to offer this powerful **Waterbury Grinder** at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

The Blake & Johnson Co., Waterbury, Conn.

Tel. Main 6755 Jos. Bickerstaff, Mgr.

THE ELM CUTTING OIL COMPANY

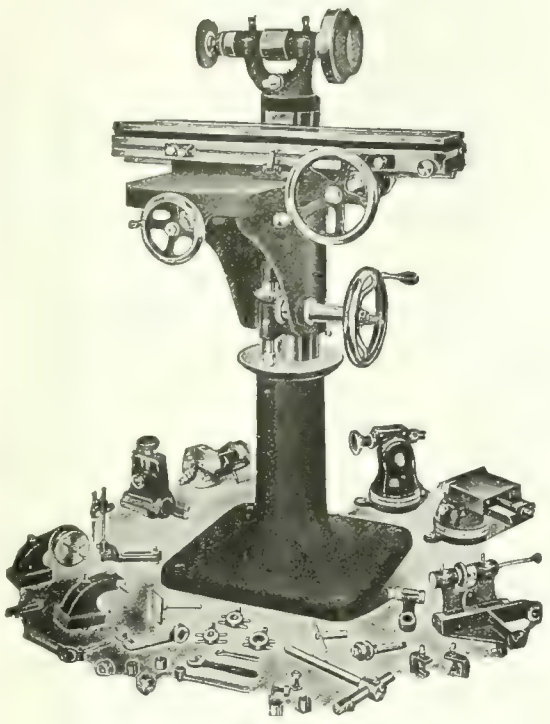
645 East King Street
TORONTO

You have tried the rest. Now use the best for screw cutting and threading.

Our standard is uniformity at all times and a guarantee of quality with every barrel of oil produced.

PRICES ON APPLICATION

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



The Greenfield

For General Tool Room Work

This Grinder is furnished with attachments for grinding all kinds of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

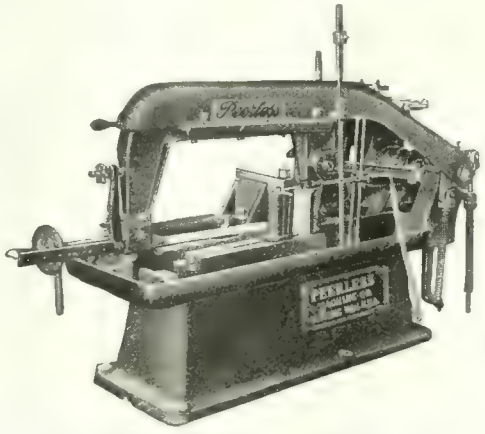
These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angle can be at once obtained.

The whole machine is thoroughly well built, well finished and will be found a dependable, convenient grinder.

Greenfield Machine Company
GREENFIELD, MASS., U.S.A.

DON'T be governed by World-Wide Reputations and Previous Records in selecting your next Cutting-Off Equipment. The NEW IMPROVED PEERLESS High Speed Heavy Duty Metal Cutting Saw has completely revolutionized and upset all metal cutting standards.

This statement is based entirely upon the reports and repeated orders received from concerns that had heretofore used tools such as referred to.

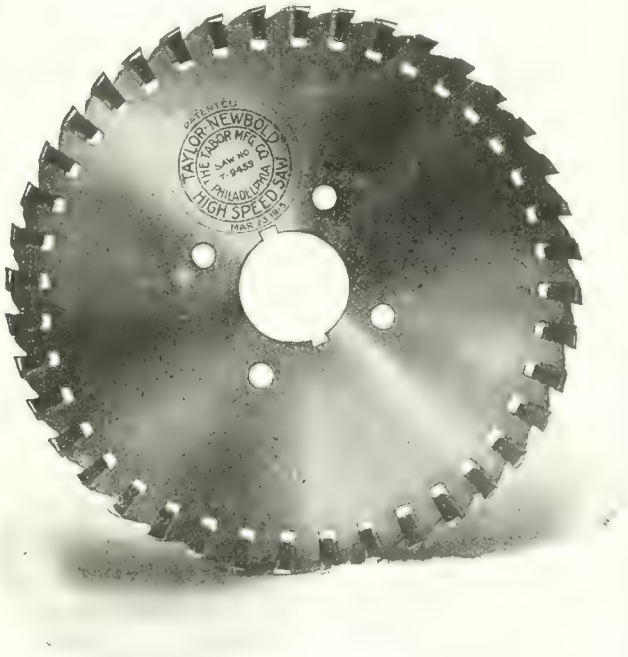


To induce investigation we will gladly ship one for a comparative test. If you do not consider it the best and most profitable tool you have ever purchased, you are under no obligations to keep it, and we will stand the freight charges both ways.

Would you like to see a list of large manufacturers that are continually repeating their orders? We have it ready for you.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
Tabor Mfg. Co., Philadelphia, U.S.A.

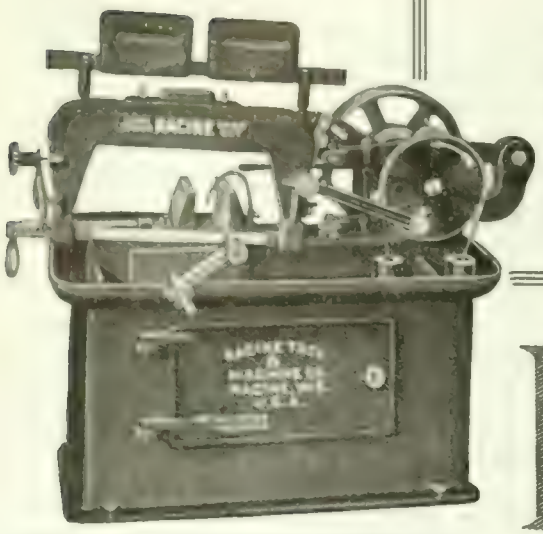
If interested, tear out this page and keep with letters to be answered.

Known the World Over
Admitted to be Superior

The Racine for Scientific Metal Cutting

Demonstrate the value of this machine in your own shop, on your own work. Our confidence in the ability of this machine is such that we will send it to you on *trial*. This will give you ample opportunity to study the machine from close quarters; to verify our statements regarding simple construction and operation, accuracy and speed, features that stamp our machine in a class by itself.

We invite your inquiries for full information and installation



Racine Tool & Machine Co.
15 Melbourne Ave. Racine, Wis., U.S.A.

RACINE

J. E. WING
TOOL ROOM
SURFACE GRINDER

is extra strong in every part, easily adjusted, and unbeatable for fast and accurate tool room work. Use it for 10 minutes and you'll know the advantage of its rigid grinding surface—its rigid construction throughout. Is equipped with large tray and water pot combined.

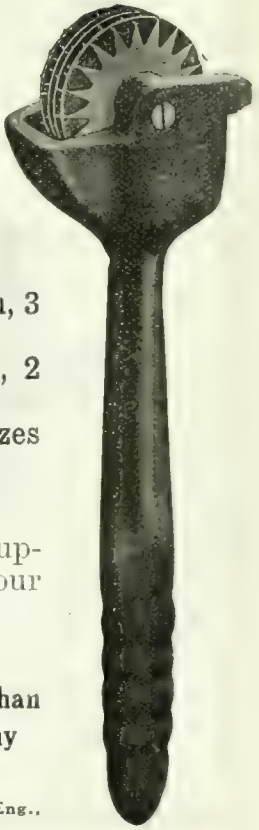
PUT YOUR SPECIAL MACHINERY WANTS UP TO US.

We are experts on special designs and guarantee satisfaction.

J. E. Wing & Son, Hamilton, Canada

Grinding Wheel Dressers

We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.



Our Dressers are:

Diamo-Carbo
Desmond Huntingdon, 3 sizes
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

We can promptly supply your needs from our stock.

The Canadian Desmond-Stephan Manufacturing Company
HAMILTON, ONTARIO

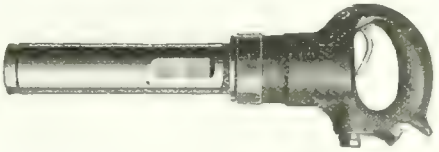
Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

CLEVELAND RIVETING, CHIPPING, CALKING AND BEADING HAMMERS

MOST POWERFUL AND EFFICIENT AIR TOOLS ON THE MARKET

Cleveland Pocket-in-Head Riveters are made in 15 styles, with Outside and Inside Latch, and have driving capacities of ¼-in. to 1½-in. rivets in Boilers, Tanks, Stacks, etc.



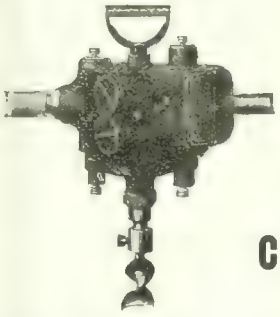
The New Cleveland Pocket-in-Head Riveter is shorter over all, hits a harder blow, uses less air in operation; has higher speed with less recoil than any riveter on the market. Let us prove it in your shop.

CLEVELAND CHIPPING HAMMERS

are made in 19 styles and sizes to suit all classes of work. They are ideal tools for foundries, as they have high-speed, no recoil, and are practically dust-proof.

CLEVELAND WOOD-BORING MACHINES

FOR BUILDING WOOD CARGO SHIPS, Etc.



The Cleveland No. 20W Wood Boring Machine illustrated, is a light-weight, high-speed motor with a capacity of 2-in. in wood; it is very compact and easily handled by one man. We make four sizes, covering a range in wood from 1 inch to 4 inches. We also manufacture 61 types and sizes of Air Drills for Metal Drilling, Reaming, Tapping, etc.

IN STOCK: Riveting and Chipping Hammers, Air Drills, Wood Drills, Sand Rammers, Bowes Air Hose Couplings, Rivet Sets, etc.

Write for Latest Catalog No. 14.

Address all inquiries to

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, Limited

84 CHESTNUT STREET, - TORONTO, ONT.

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

Carry Your Grinder to the Work Not Your Work to the Grinder

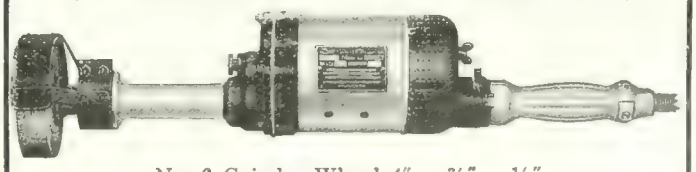
Thor

Portable Electric GRINDER

Equipped with Universal Motor for Operating on Direct or Alternating Current

110 TO 250 VOLTS

(Licensed Under Burke Universal Motor Patent.)



No. 6 Grinder-Wheel 4" x ¾" x ½"

ATTACH TO ANY LAMP SOCKET

Thor Portable Electric Grinder is equipped throughout with ball and roller bearings, and has a specially constructed motor, insuring speed, power, ease of operation and increased capacity.

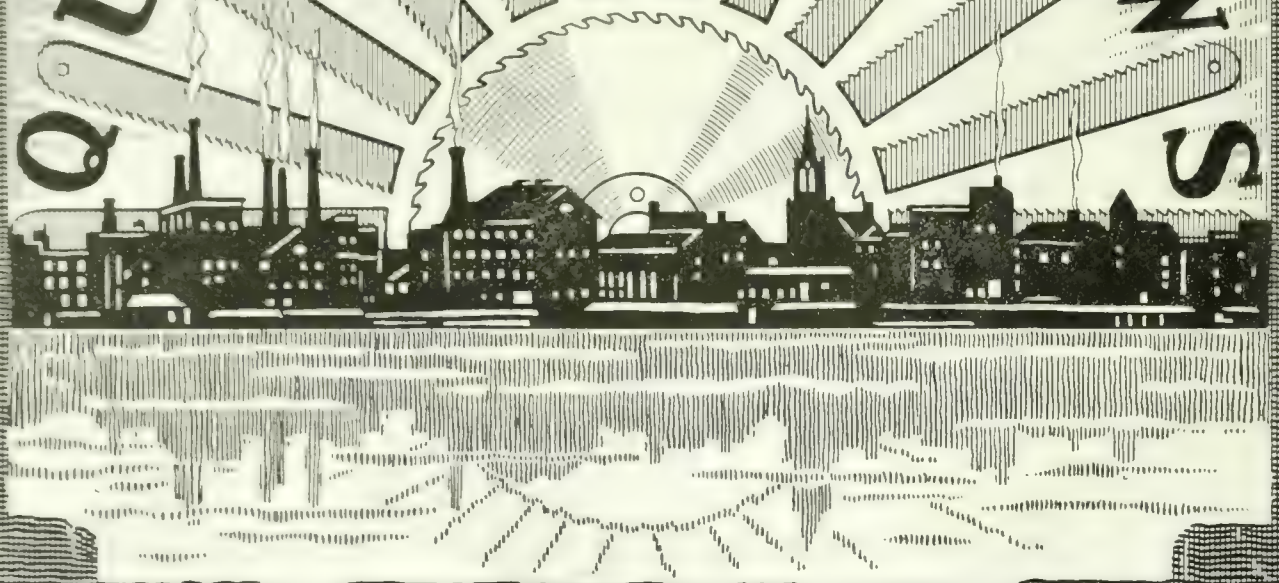
IT RUNS AT 4,500 R.P.M.

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W.; Winnipeg: 123 Bannatyne Ave. E.; Vancouver: 1142 Homer Street

THE SUN NEVER SETS ON QUALITY SAWS



EVERY TOOTH CUTS

ON EVERY QUALITY SAW

THEY CUT STRAIGHTER AND LAST LONGER

Canadian Representatives : F. Bacon & Company, Montreal, Canada

NAPIER SAW WORKS Inc.
SPRINGFIELD, MASSACHUSETTS U.S.A.

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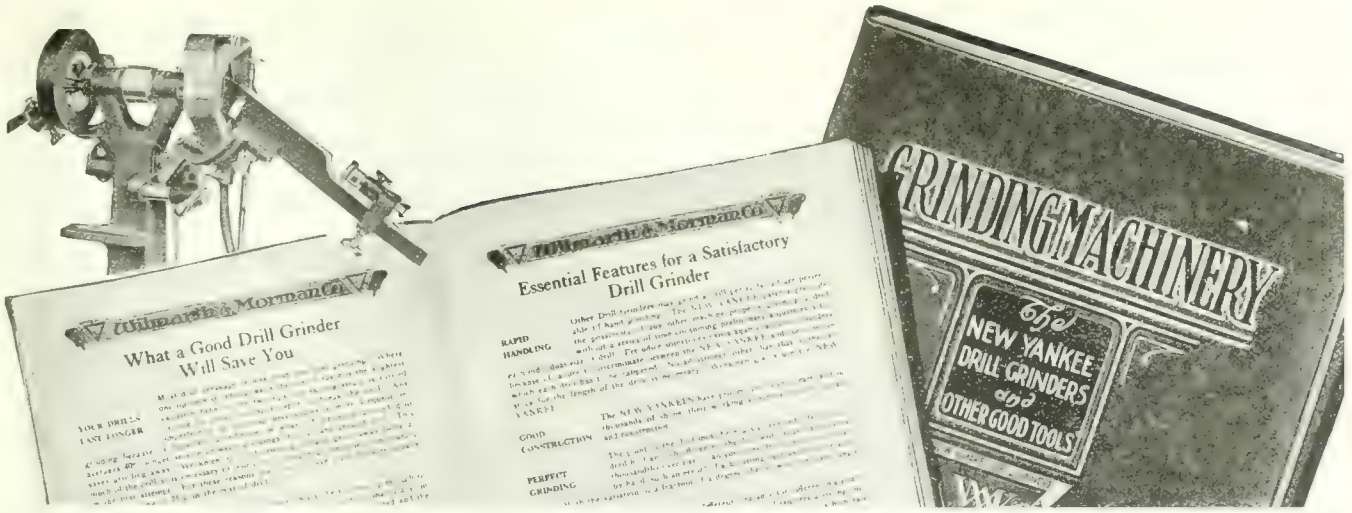
Wilmarth & Morman Co.
What a Good Drill Grinder Will Save You
Wilmarth & Morman Co.
Essential Features for a Satisfactory Drill Grinder
GRINDING MACHINERY
65 NEW YANKEE DRILL GRINDERS and OTHER GOOD TOOLS

10,000 New Yankee Drill Grinders

ARE SAVING

MILLIONS OF DOLLARS

FOR THEIR USERS

Catalog No. 107 describes 100 styles and sizes of New Yankee Drill Grinders. Also W. & M. Surface Grinders and Universal Cutter and Tool Grinders. **It's free. Sign and mail coupon now.**

WILMARTH & MORMAN CO.

1200 Monroe Ave., N.W., Grand Rapids, Michigan, U. S. A.

Also Manufacturers of Surface and Universal Grinders

Wilmarth & Morman Co.,
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Grand Rapids, Mich.

Gentlemen:

Please mail Catalog No. 107 and advise regarding New Yankee to meet our requirements.

Our drills range from.....to.....

Name..... ....

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STERLING
HACK SAWS

Are known the world over for their efficient cutting quality which insures conomy and satisfaction.

You will make no mistake in buying "Sterling" Blades for the following reasons:

1st—They are made of the very best quality of steel rolled by any mill in the world.

2nd—The best mechanical construction which has been acquired by many years of experience.

3rd—Special heat treatment which goes to make the efficiency both for maximum quality and uniformity.

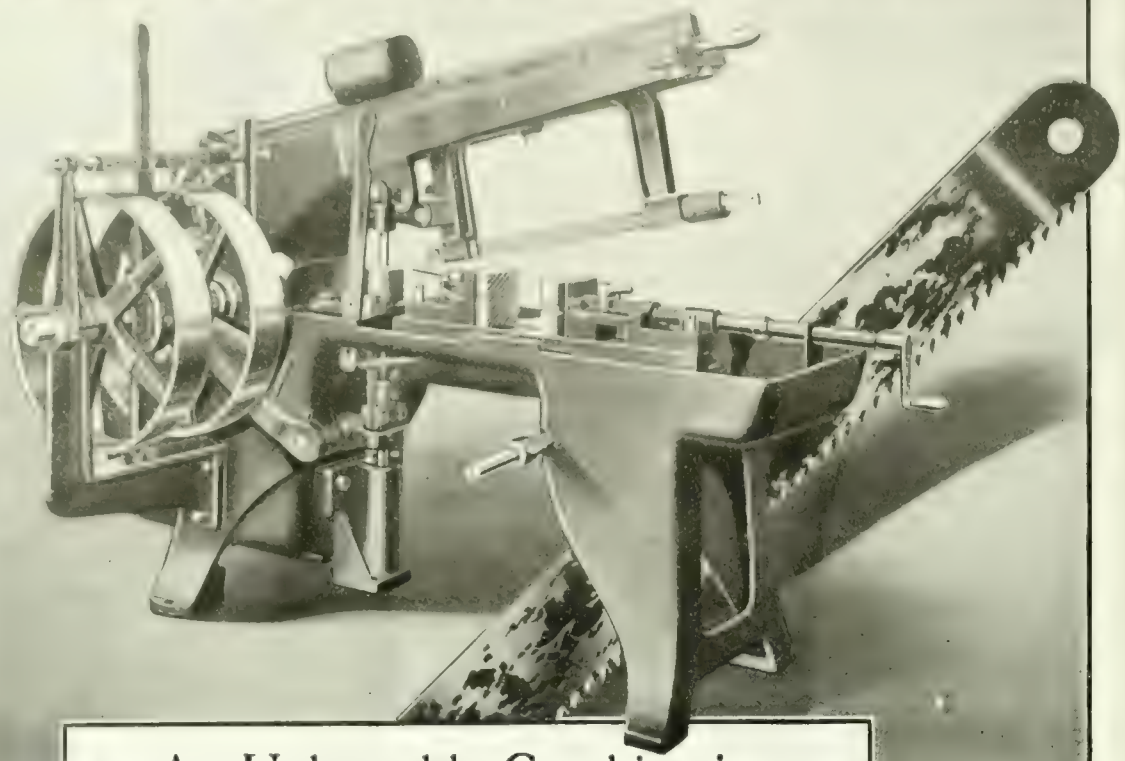
A trial will convince you.

MANUFACTURED BY

Diamond Saw & Stamping Works

BUFFALO, N. Y., U.S.A.

An Unbeatable Combination



An Unbeatable Combination

Are you a manufacturer of metal products, where accuracy, speed, production and economy count, and which require constant cutting-off of stock.

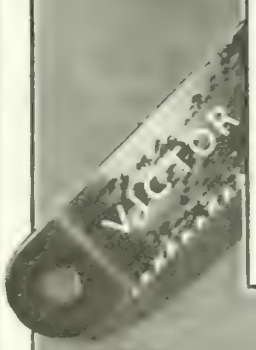
Here's The Combination You Are Looking For

The V. S. W. No. 5 High Speed Hack Saw Machine equipped with a VICTOR blade is unbeatable when it comes to increased production, and a minimum amount of power blade breakage and consumption.

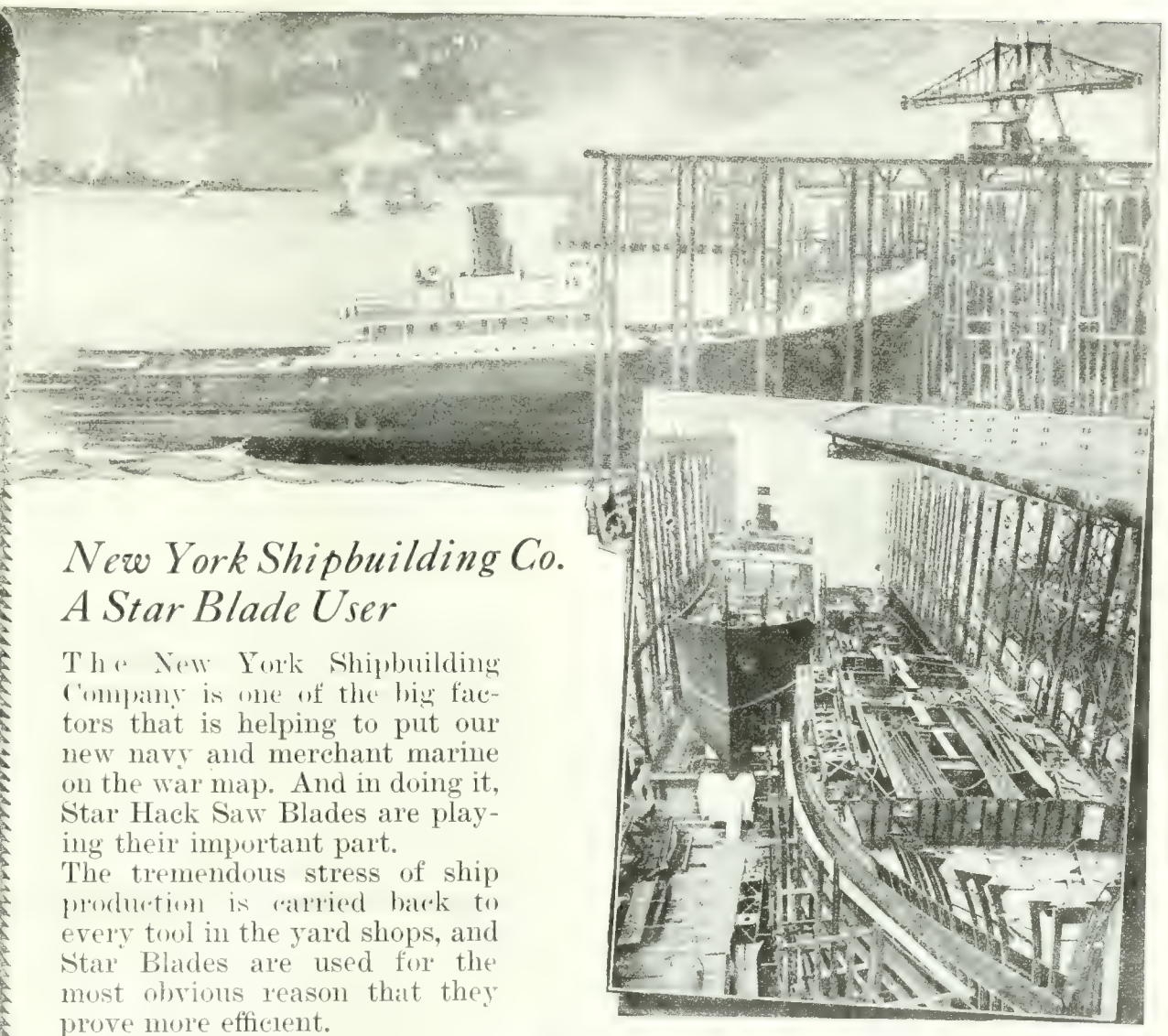
Why?

An actual machine and blade operated by one of your own men in you own shop will be the most convincing demonstration we can make.

Let us send you one V. S. W. machine on a thirty days' trial, with enough VICTOR blades to show you why.



VICTOR SAW WORKS Ltd.-HAMILTON, CANADA



New York Shipbuilding Co. A Star Blade User

The New York Shipbuilding Company is one of the big factors that is helping to put our new navy and merchant marine on the war map. And in doing it, Star Hack Saw Blades are playing their important part.

The tremendous stress of ship production is carried back to every tool in the yard shops, and Star Blades are used for the most obvious reason that they prove more efficient.

Here's still another proof of Star Blade betterness that ought to impress every man who uses a hack saw.

When you are looking for the most efficient saw, play safe and follow the big concerns with millions in production at stake who have spent thousands to find out the facts. Do as they do and you will standardize on

STAR HACK SAW BLADES

Or make the tests yourself—for speed, for endurance or for low cutting cost and you cannot help coming to the same conclusions if you make a thorough test.

The Star was the first modern hack saw blade and for thirty years its distinctly better quality has kept it the largest selling blade.

This greater efficiency and endurance of Star Blades is no accident but the result of hundreds of thousands of tests of steel composition, of tempering, of relative dimensions and of shape and setting of teeth.

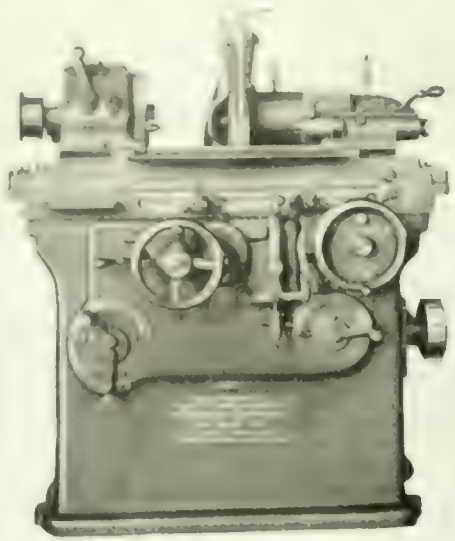
Then the standards set for Star Blades has been uniformly attained in production at every stage by special automatic machinery which gauges to the finest limits that make the smallest variation a mechanical impossibility. At the same time this special machinery gives us an enormous quantity production at a minimum factory cost.

If you are not satisfied with your present metal cutting results, have any reason to believe they can be improved or have any special cutting problems, write our Engineering Department, 230 River St., Millers Falls. We are at your service, regardless of what blades you are using.

Manufactured By
CLEMSON BROS. Inc.
MIDDLETOWN, NEW YORK

Sole Distributors
MILLERS FALLS CO.
MILLERS FALLS, MASS.

FITCHBURG SIX-TWENTY



Bulk Doesn't Make a Grinder

any more than bulk makes a man.

Both watch and clock tell time. But isn't the little watch almost always the more reliable?

Bulkier Machines cannot grind more accurately than this compact Fitchburg Six-Twenty. Bulkier Machines fall behind when it comes to speed.

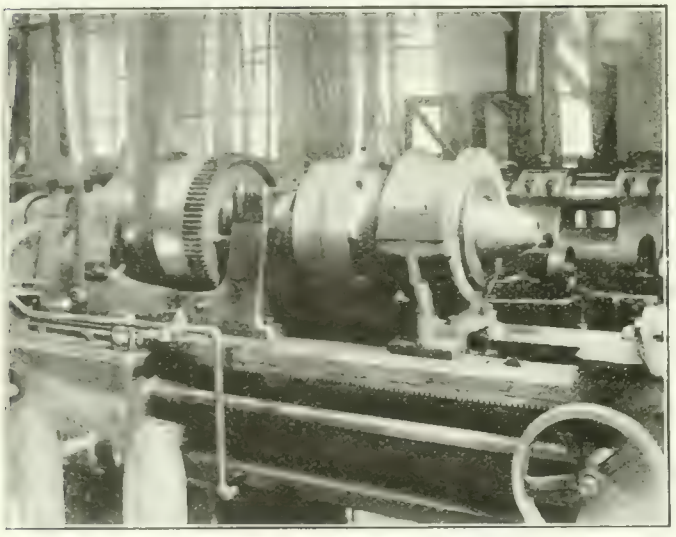
Occupying much less floor space, demanding considerable less effort, Fitchburg Six-Twenty best grinds all work within its range—and its range admits a big percentage of all Straight and Taper work.

The travel of the table is within control of a single lever, and may be started or stopped at any part of its stroke. Variable table dwell and automatic cross-feed with positive stop facilitate duplicate grinding.

Write us to-day for all the facts and illustrated catalog.

Fitchburg Grinding Machine Co.

76 Winter Street **Fitchburg, Mass.**



Cut shows Chuck on nosing operation. This is one of over two hundred in this Canadian plant.

This chuck is *built on the duplicate part system. It is simple, effective and fool-proof.*

It grips the shell in a predetermined position. The jaws will not slip on the shell. It has shell interior and exterior adjustable stops.

A trial on one of your lathes will convince you that this is THE chuck for shell work.

A Big Efficiency Unit in Your Shell Plant

A. J. LAVOIE'S LOW PRESSURE Compressed Air Chuck

This chuck can be applied to any make of lathe, without alteration to the machine, and will increase production from 25% to 75%. It grips and releases the shell while in motion—no need to stop your machine.

It is a single unit combination attached to the face plate of lathe, supported by an additional heavy duty bearing, thus making a heavy duty lathe out of a light machine. A small lever operates the chuck. Will operate with a pressure of 60 lbs. per sq. in.

MANUFACTURED BY

The Montreal General Tool Co.

673-5 Notre Dame Street, Maisonneuve, Montreal, P.Q.

Also manufacturers of shell tools, and special machine attachments of all kinds made to order.

MODERN

SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

Illustration shows an installation of "MODERN" Die Heads threading Shell Ogives, where the requirements are precision and large production.

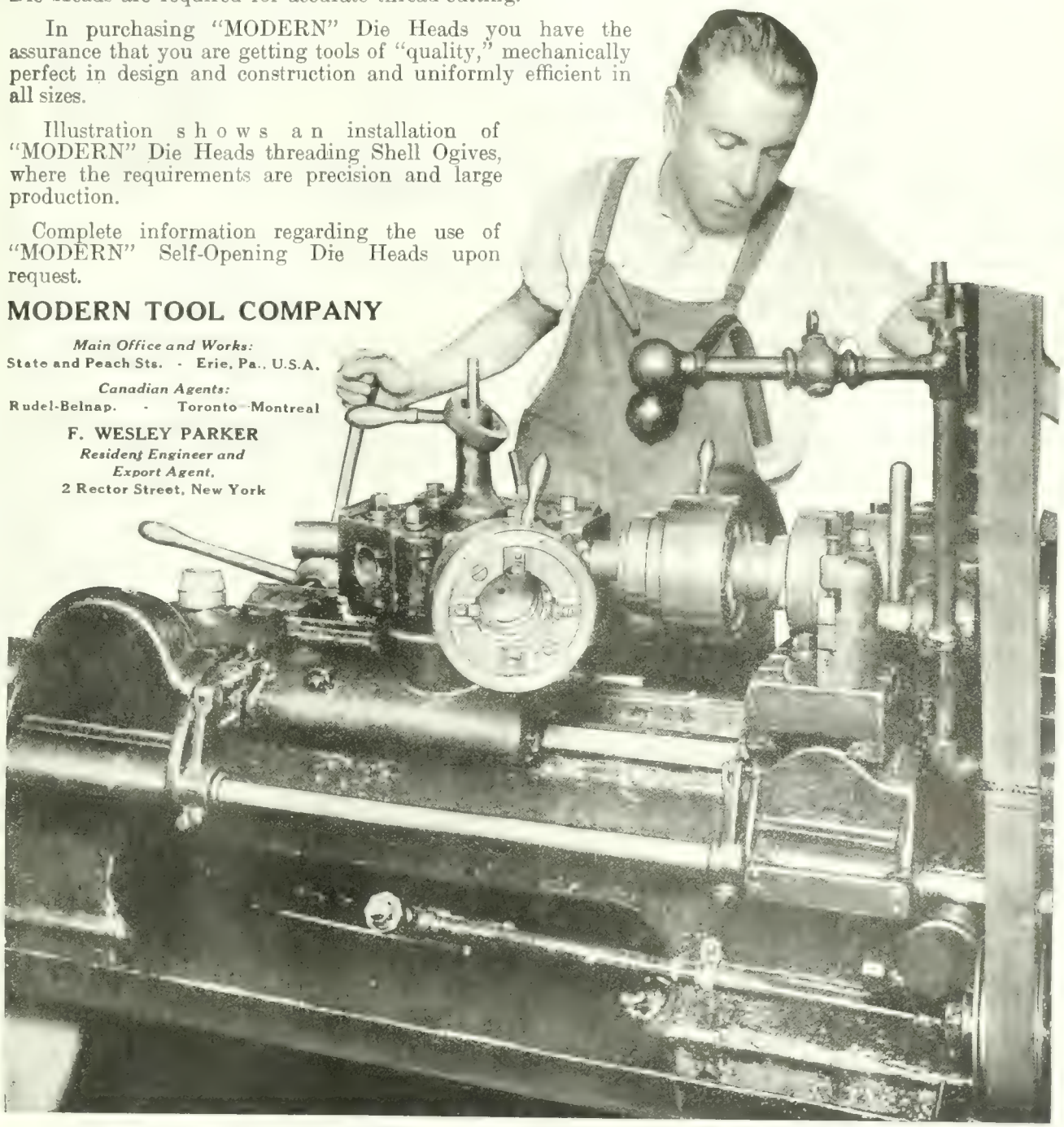
Complete information regarding the use of "MODERN" Self-Opening Die Heads upon request.

MODERN TOOL COMPANY

Main Office and Works:
State and Peach Sts. - Erie, Pa., U.S.A.

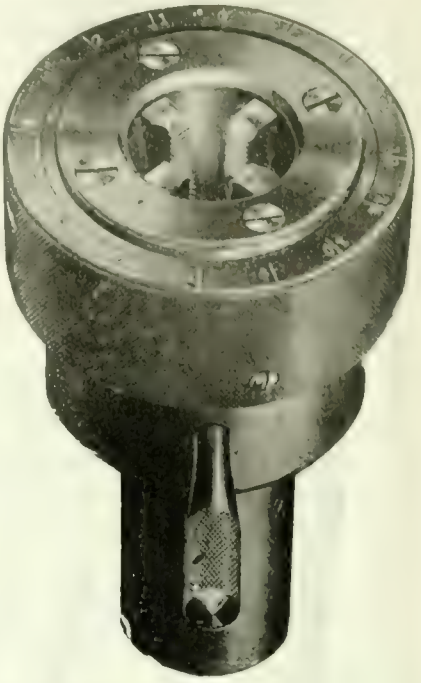
Canadian Agents:
Rudel-Belnap. - Toronto Montreal

F. WESLEY PARKER
Resident Engineer and Export Agent,
2 Rector Street, New York



If any advertisement interests you, tear it out now and place with letters to be answered.

Handle 75-M/M Shells Just Once



"Two Murchey Taps can cut into completely finish this shell so that when it comes off the machine there is no more handling or reaming to do. Therefore

Murchey Tap Them

By using Murchey Collapsing and Adjustable Taps, you save two minutes or more on every 75-mm Shell. Leave that in dollars for yourself!

Practically all the large plants of the United States are lining up with Collapsing Taps to thread the nose of this shell. No minute must be knowingly wasted.

Murchey Chasers are quickly adjusted to compensate for wear, and Murchey Adjustable Taps serve as long as ten solid Taps.

WRITE AT ONCE FOR ALL PARTICULARS.

Murchey Machine & Tool Company

75 Porter Street, Detroit, Mich.

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S. W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France

Lightning Deliveries

—That is Murchey Service

Jacobs IMPROVED Drill Chuck

A Winner By Sheer Merit

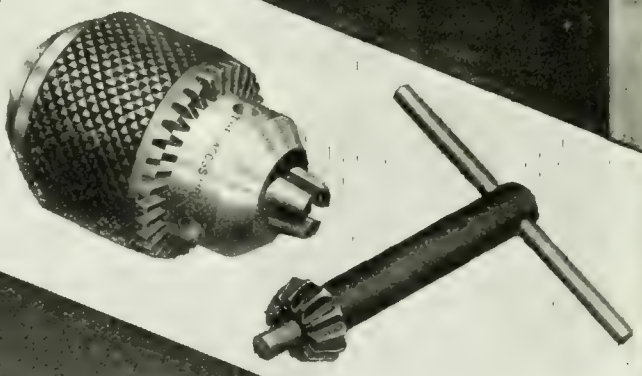
Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

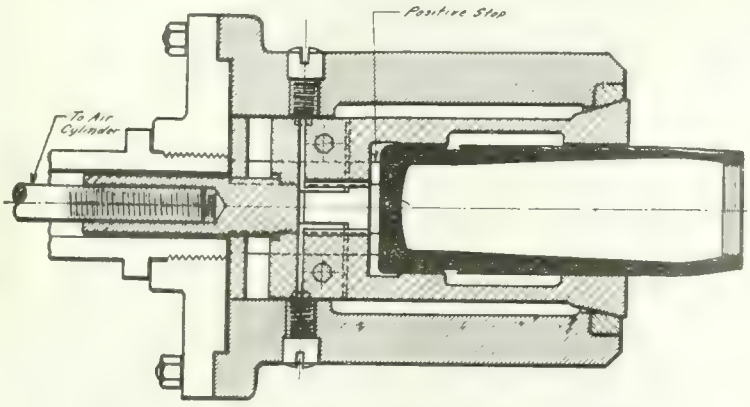
MADE BY

The Jacobs Manufacturing Co.

Hartford, Conn., U.S.A.



EVERY MINUTE EVERY DAY PRODUCTION SPEEDED



M. E. C. THREE JAW HINGED COLLET CHUCKS

with steel body are almost everlasting. Not one complicated part to get out of order. Grip firm and positive, their simple air valve control greatly facilitates the quick insertion or withdrawal of work.

Instead of wasted minutes chucking with slow hand-operated chucks, do the same work in seconds, and do it better, with M. E. C. Three Jaw Chucks—compressed air operated.

M. E. C. Chucks
Air Operated

are 100% efficient wherever rapid manufacturing and absolute accuracy are the demands.

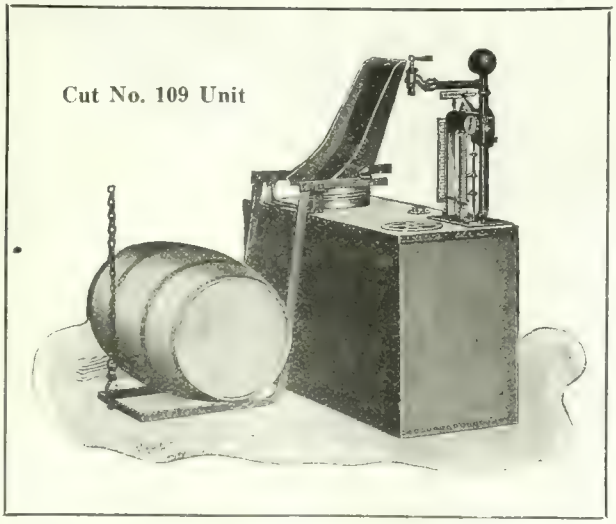
Know what great helps to speed production M. E. C. Chucks and Air Cylinders have proved themselves. Write to-day for our catalogue and 30-day free trial plan.

Manufacturers Equipment Company

175-179 North Jefferson St., CHICAGO, ILL.

CANADIAN AGENTS: J. R. Stone Tool and Supply Co., Detroit, Mich.
New York: J. R. Stone Tool and Supply Co., 30 Church St.

A Convenience—*that brings*—Economy



The Bowser System can be added to whenever more storage capacity is required. It is convenient, economical and fire-proof. Write for illustrated bulletin—to-day.

ECONOMY is the great thing to-day. It applies to every necessity; in the shop to time, labor and materials—it means quicker and greater production with less effort and cost. Production is increased when machines are lubricated properly; upkeep and labor is reduced and time saved.

Oil, therefore, is a necessity that should be protected by modern storage and handling facilities so that waste, careless handling, evaporation and deterioration of oil will be stopped, and the danger of interruption to production by fire, removed.

Ideal provision for the economical Storage and Distribution of Oil is embodied in the

BOWSER ESTABLISHED 1885

Oil Storage System

It is designed and built for any oil storage or distributing requirement, large or small, hand or power operated.

It is durable, accurate and safe; promotes efficiency, suggests cleanliness, lightens labor, and saves oil and money.

Every Shop Needs It.

S. F. Bowser & Co., Inc.

TORONTO, ONTARIO, CANADA
Sales Offices in All Centers
Representatives Everywhere

If any advertisement interests you, tear it out now and place with letters to be answered.

Every Butterfield Tap comes to you ready for long, hard service.

It is made by expert workmen—from the finest materials obtainable—and thoroughly tested before shipment.

For the tap that is uniformly dependable in service — specify Butterfield.

Butterfield & Co., Inc.
Rock Island :: Quebec

Toronto Office:
1505 Traders Bank Building : Phone Main 1382
H. A. HARRISON, Manager

Catalog No. 16 containing the complete line of Butterfield Tools awaits your request.

BUTTERFIELD

Hannifin
Air Chuck

"Each Operator Averaged 10 More Shells per Day"

In his report to plant owner the works manager quoted recommended disposal of all remaining screw-operated box chucks.

His report was made three months after a partial change to Hannifin Air Chucking.

Six weeks later every lathe in the plant was equipped with Hannifin Air Operated Chucks.

At this time Hannifin Air Operated Mandrels were also installed.

The plant in question is producing 6-inch shells.

It is nothing unusual for Hannifin Air Operated Chucking and Clamping Equipment to add an extra day in time saved to each week.

In many of the largest plants in this country and Canada, Hannifin Air Operated Equipment has increased output from 20 to 80 per cent. In a number of plants it has actually *doubled* output.

If your work requires quick handling and rigid never-slip grip, for you to do without Hannifin Air Operated Chucking and Clamping Equipment is to do without profits within your reach.

Say you would like our catalog

HANNIFIN MFG. COMPANY, Chicago, U.S.A.

LOCAL REPRESENTATIVES: C. C. Firmin, Detroit; Carl Naumann, Syracuse; R. E. Ellis Engineering Company, Chicago, Ill.
FOREIGN REPRESENTATIVES: A. R. Williams Machy. Co., Ltd., Toronto, Can.; Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, Glasgow and Newcastle-on-Tyne; Fenwick Freres & Company, 1500 Rue Fenelon, Paris, France; Iznosskoff, Suckau & Co., Petrograd, Moscow, Ekaterinberg and Odessa, Russia.

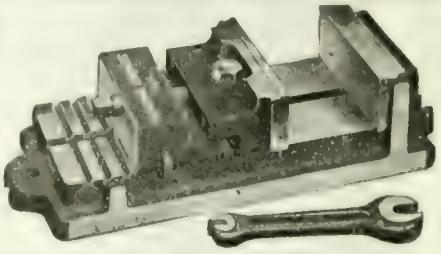
HINTS TO BUYERS

BRISTOL'S ELECTRIC PYROMETERS FOR EVERY SERVICE

Write for Bulletin 1-205.

THE BRISTOL CO.
WATERBURY, CONN., U.S.A.

SKINNER DRILL PRESS VISE



A substantial, durable tool which will pay for itself in short order in any machine shop. Four sizes to accommodate a wide range of work. Try one and you'll buy more.

Printed matter promptly mailed on request.

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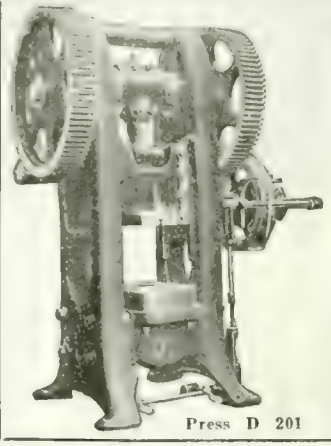

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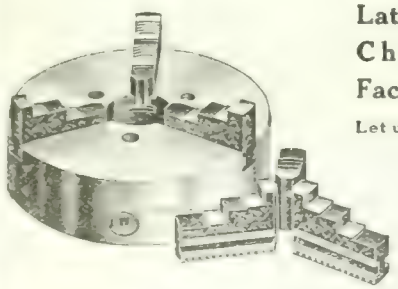

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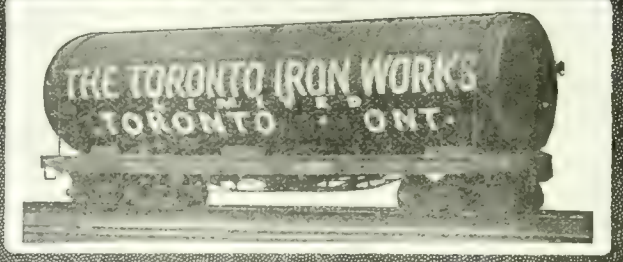

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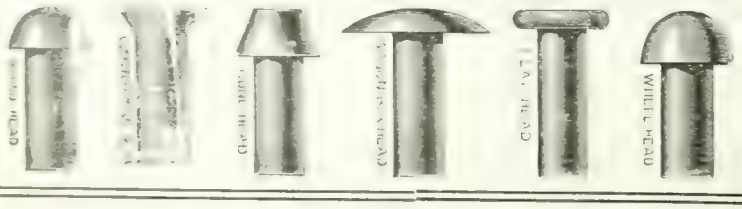

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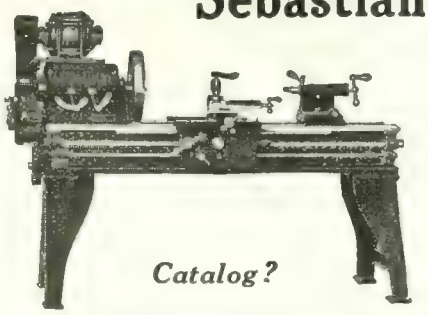

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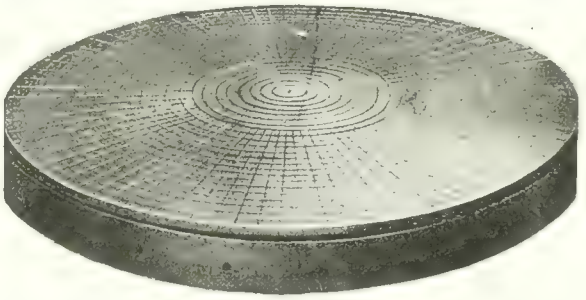

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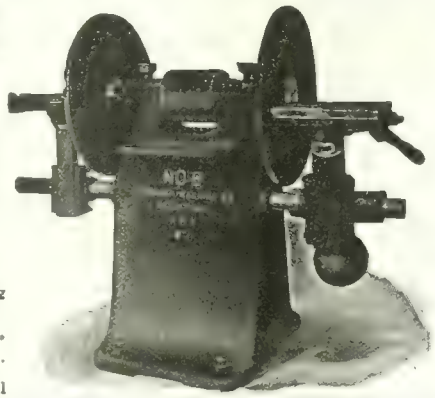

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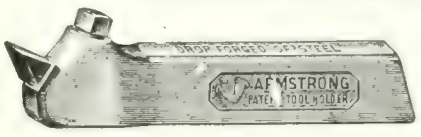

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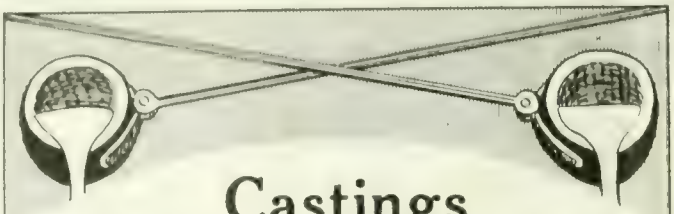

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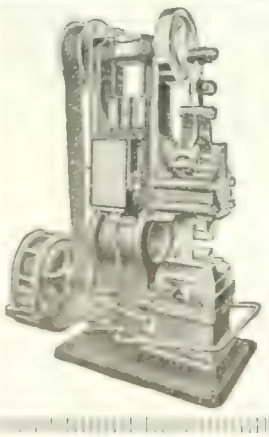

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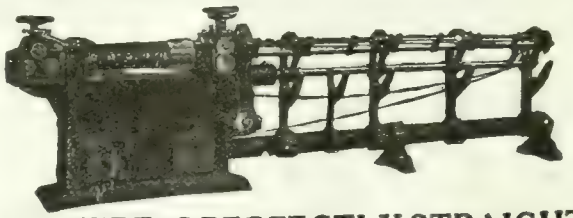

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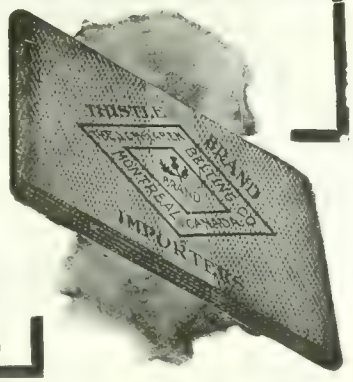

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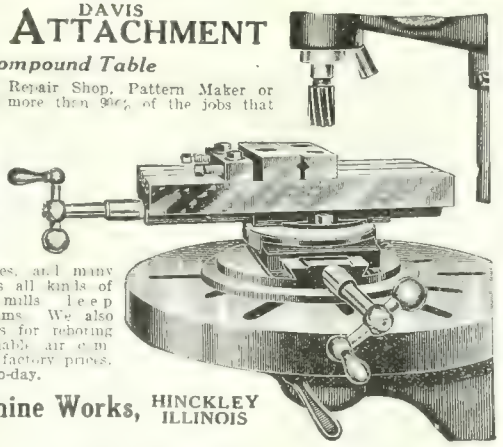

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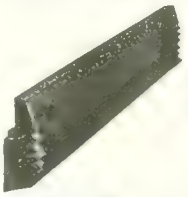

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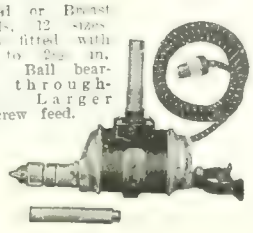

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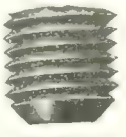
CLEAN SOCKET HOLES · 30% STRONGER · UNIFORM THREADS · ABSOLUTE SAFETY



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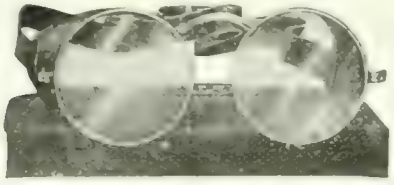

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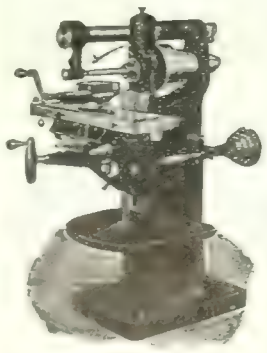

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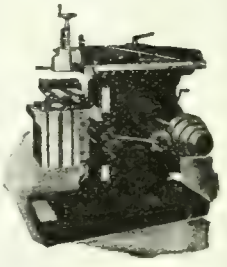

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Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Whitney Mfg. Co., Hartford, Conn.

BELTING, CONVEYOR
Goodyear Tire & Rubber Co., Toronto, Ont

BELTING, LEATHER
Canadian Fairbanks-Morse Co., Montreal
Can. B. K. Morton, Toronto, Montreal
Graton & Knight Mfg. Co., Worcester, Mass.
Goodyear Tire & Rubber Co., Toronto, Ont.
Jones & Glassco, Montreal.
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Baxter & Co., Ltd., J. R., Montreal, Que.
Bennett, W. P., 51 Montford St., Montreal, Que.
Dominion Belting Co., Hamilton, Ont.
Federal Engineering Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal Que.

BENCH LEGS, STEEL
New Britain Mach. Co., New Britain, Conn.

BENCH DRAWERS, FRICTIONLESS
New Britain Mach. Co., New Britain, Conn.

BENDING MACHINERY
John Bertram & Sons Co., Dundas
Bertrams, Limited, Edinburgh, Scotland
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Canada
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Charles F. Elmes Eng. Works, Chicago
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Steel Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BINS, STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto, Ont.

BLASTING MACHINES, SHOT AND STEEL GRIT
Gray Mfg. & Mach. Co., Toronto, Ont.
U. S. Sales Co., Chicago, Ill

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING
Dominion Central Drawing Office, McGill Bldg., Montreal, Que.

BLUE PRINTING MACHINERY
Mullmer-Enlund Tool Co., Syracuse, N.Y.

BOARTZ
Geo. A. Joyce Co., Ltd., New York, N.Y.

BOILERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Marsh & Henthorn, Ltd., Belleville, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal Que.
Riverside Machinery Depot, Detroit, Mich.
Sterling Engine Works, Winnipeg, Man

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Goodyear & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
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Victor Tool Co., Waynesboro, Pa.

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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

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Gardner, Robt., & Son, Montreal.
Garlock Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jarvis Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Hartford Chuck Co., Hartford, Conn.

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Pratt & Whitney Co., Dundas, Ont.

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Whiting Foundry Equipment Co., Harvey, Ill.

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Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
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Garlock-Walker Machinery Co., Toronto, Ont.
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Niles-Bement-Pond Co., New York, N.Y.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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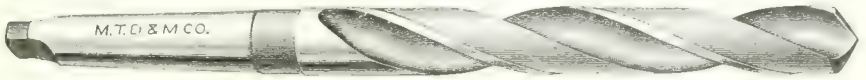

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Cincinnati Planer Machy. Co., Cincinnati, Ohio
Garlock Walker Machinery Co., Toronto, Ont.
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Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

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H. A. Drury Co., Montreal.
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Cleveland Twist Drill Co., Cleveland.
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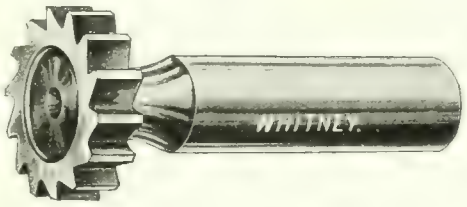

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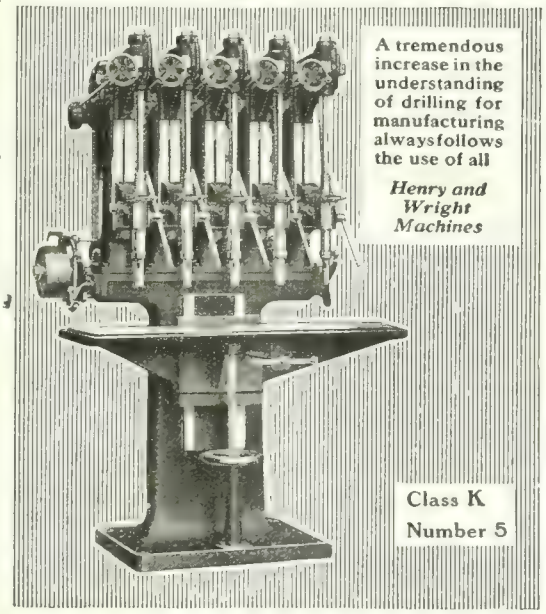
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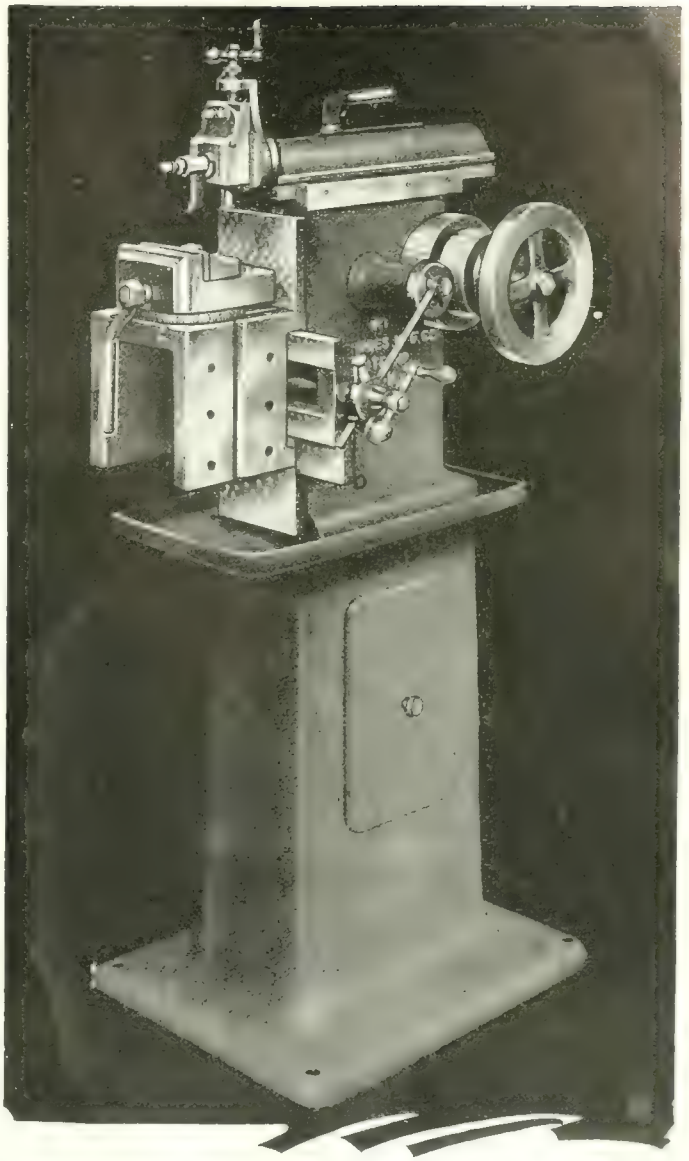

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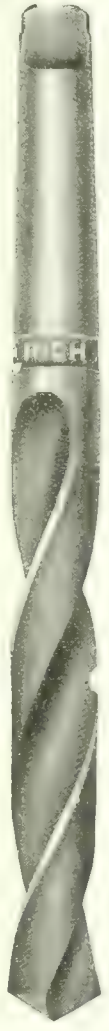

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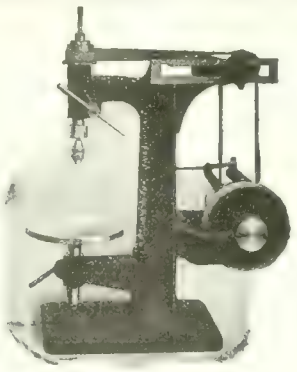

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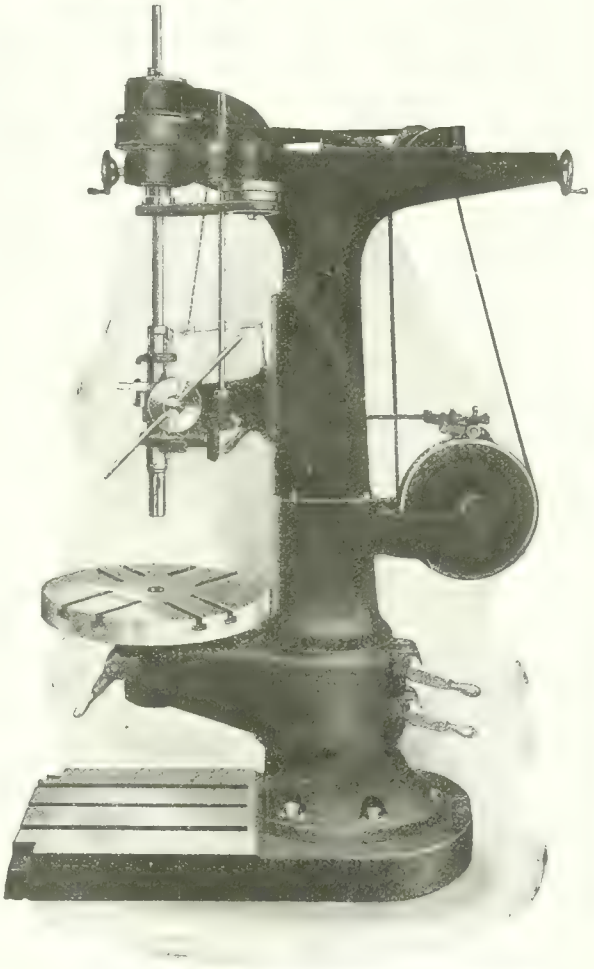

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Cornell Manufg. Co., Plattsburg, N.Y.
HAMMERS, STEAM
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Worcester, Mass.
Hoskins Steel Forging Co., Chicago, Ill.
HANGERS, SHAFT
Baird Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Montreal, Que.
Can. S K F Co., Toronto, Ont.
Gardner Bros. & Son, Montreal, Que.
Jones & Glassco, Montreal, Que.
Link-Belt Co., Philadelphia, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
HARDENING AND TEMPERING
Bertram & Sons Co., John, Dundas, Ont.
Holz, Herman A., 1 Madison Ave., New York.
Ontario Tempering Furnace Co., Montreal, Que.
HARDNESS TESTING INSTRUMENTS
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York.
HEATERS
Steele & Sons Co., Wm. B., Pittsburgh, Pa.
Sturtevant Co., B. F., Galt, Ont.
HEATING AND VENTILATING ENGINEERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
HEAT GAUGES, HARDENING AND ANNEALING
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York.
HIGH SPEED TOOL METAL
Ludlum Steel & Spring Co., Watervliet, N.Y.
Taylor-Wharton Iron & Steel Co., High Bridge, N.J.
Toronto Smelting & Refining Co., Toronto, Ont.
HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.
Illinois Tool Works, Chicago, Ill.
HINGES
London Bolt & Hinge Works, London, Ont.
HOBS
Illinois Tool Works, Chicago, Ill.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
HOBS, MILLING
Bertram & Sons Co., John, Dundas, Ont.
Jones & Glassco, Montreal, Que.
HOISTING AND CONVEYING MACHINERY
Can. Matthews Gravity Carrier Co., Toronto, Ont.
Jenckes Mach. Co., Sherbrooke, Que.
Jones & Glassco, Montreal.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Robertson Co., H. W., Montreal, Que.
Whiting Foundry Equipment Co., Harvey, Ill.
HOISTS, CHAIN AND PNEUMATIC
Bertram & Sons Co., John, Montreal, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Ford Chain Block & Mfg., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
Wright Mfg. Co., Lisbon, Ohio.
HOISTS, ELECTRIC
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Kennedy & Sons, Owen Sound, Ont.
Northern Crane Works, Walkerville, Ont.
Winnipeg Gear & Engrng Co., Winnipeg, Man.
HOLDERS, STEEL DIE FOR MARKING
Marsh & Henthorn Ltd., Belleville, Ont.
Matthews, Jas. H., & Co., Pittsburgh, Pa.
HOPPERS
Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Gutta Percha & Rubber Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Wells Bros. Co. of Canada, Galt, Ont.
HYDRAULIC MACHINERY
Charles F. Elmes Eng. Works, Chicago.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Robertson Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.
INDICATORS, SPEED
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.
INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.
INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.
INGOT METAL
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
IRON ORE
Hanna & Co., M. A., Cleveland, O.
JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Toronto Tool Co., Toronto, Ont.
JACKS, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.
JACKS, PNEUMATIC
Northen Crane Works, Walkerville.
JACKS, PIT AND TRACK
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
JIGS, TOOLS, ETC.
Bertram & Sons Co., John, Dundas, Ont.
Bickle Engineering Co., Toronto, Ont.
Bilmer & Wilson, Hamilton, Ont.
Brown Tool Works, Chicago, Ill.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Chicago Canada Ltd., Sam'l, Montreal, Que.
Toronto Tool Co., Toronto, Ont.
KEY SEATERS
Gisholt Machine Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.
KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.
KILNS
Can. Blower & Forge Co., Kitchener, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Sheldons, Limited, Galt, Ont.
LABELS AND TAGS
Matthews, Jas. H. & Co., Pittsburgh, Pa.
LABORATORIES, INSPECTION AND TESTING (SEE CHEMISTS)
LADLES, FOUNDRY
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.
LAMPS, INCANDESCENT AND NITROGEN
Can. Laco-Philips Co., Toronto, Ont.
LAMPS, TUNGSTEN (Vacuum and Gas Filled)
Can. Laco-Philips Co., Toronto, Ont.
LATHES, BENCH
H. E. Streeter, New Birks Bldg., Montreal, Que.
LATHES, CHUCKNG
Acme Machine Tool Co., Cincinnati, Ohio.
LATHE CHUCKS (SEE CHUCKS)
LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Curtis & Curtis Co., Bridgeport, Conn.
Hendey Machine Co., Torrington, Conn.
Rivett Lathe & Grinder Co., Boston, Mass.
Williams & Co., J. H., Brooklyn, N.Y.
Winnipeg Gear & Engrng Co., Winnipeg, Man.
LATHES, AXLE
Bridgeford Mach. Tool Works, Rochester, N.Y.
LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Can. Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
LATHES, BAND TURNING
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Warden King Co., Montreal, Que.
LATHES, BRASS
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Inc., Chicago, Ill.
LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Bridgeford Mach. Tool Works, Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, Ohio
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
McCabe, J. J., New York, N.Y.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Sebastian Lathe Co., Cincinnati, Ohio.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
LATHES, JOURNAL TRUEING
Bridgeford Mach. Tool Works, Rochester, N.Y.
McCabe, J. J., New York, N.Y.
LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garlock-Walker Machy. Co., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
LATHES, SINGLE PURPOSE
Bertram, John, & Sons Co., Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Mfg. & Mach. Co., Toronto, Ont.
Hepburn, John T., Ltd., Toronto.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Plessisville Fdrs., Plessisville, Que.
Roelofson Mach. & Tool Co., Toronto, Can.
LATHES, SCREW CUTTING
Bertram, John, & Sons Co., Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto.
McCabe, J. J., New York, N.Y.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
LATHES, SPINNING
Bliss, E. W., Co., Brooklin, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
McCabe, J. J., New York, N.Y.
LATHES, TURRET AND HAND
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto, Ont.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
McCabe, J. J., New York, N.Y.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
National-Acme Co., Cleveland, Ohio.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
H. W. Petrie, Toronto.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
LEAD BURNING
St. Lawrence Welding Co., Montreal, Que.
LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, Mass.
LIFTS, PNEUMATIC
Whiting Foundry Equipment Co., Harvey, Ill.
LINK BELTING
Can. Fairbanks-Morse Co., Montreal.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
LIQUID AIR
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Goods Co., Hamilton, Ont.
LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.
LUBRICATORS
Roper, C. F., & Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.
MACHINERY DEALERS
Baird Machy. Co., W. J., Detroit, Mich.
Can. Fairbanks-Morse Co., Montreal.
Dickow, Fred C., Chicago, Ill.
Garlock-Walker Machy. Co., Toronto, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.
MACHINERY GUARDS (SEE GUARDS)
MACHINERY REPAIRS
Prest-O-Lite Co., Inc., Toronto, Ont.
Sterling Engine Works, Winnipeg, Man.
Sumbling Mach. Co., W. H., Toronto, Ont.
MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES
Can. Fairbanks-Morse Co., Montreal.
Frank H. Scott, Montreal.
J. H. Williams & Co., Brooklyn, N.Y.
MACHINISTS
Welland Motor & Machine Co., Welland, Ont.
MANDRELS
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Hannifin Mfg. Co., Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Manufacturers Equip. Co., Chicago, Ill.
Monarch Brass Mfg. Co., Toronto, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
MARKING DEVICES
Pritchard-Andrews Co. of Canada, Ottawa, Ont.
Matthews, Jas. H., & Co., Pittsburgh, Pa.
MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Martin Machine Co., Greenfield, Mass.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Perrin, Wm. R., Toronto.
MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.
MEASURING TAPES AND RULES
James Chesterman & Co., Ltd., Sheffield, Eng.
METALLURGISTS
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Ltd., Toronto.
METERS, METAL TESTING
Holz, Herman A., 1 Madison Ave., New York.
METALS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Can. B. K. Morton, Toronto, Montreal.
Dom. Iron & Wrecking Co., Ltd., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
METERS, OIL, WATER
Bowser & Co., Inc., S. F., Toronto, Ont.
MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.

The Plant Behind the Drill

CELFOR

It has always been a feature of Celfor Policy to spare neither money nor effort in keeping our plant and drill making machinery up to a standard, productive of the highest efficiency in drill manufacture.

We are in a position now as never before to carry out this feature of our policy, through the recent merger of the Celfor Tool Co. with the Buchanan Electric Steel Co., in the new corporate form of the Clark Equipment Co., for this merger has made possible added capital and financial resources with which to carry on our business.

We solicit your inquiries for information regarding Celfor Tools either through our perfected dealer organization or addressed to our main office, whichever is more convenient.

Clark Equipment Co.

Buchanan, Mich. **U. S. A.**

Canadian Agents:
Rudel-Belnap Machinery Co., Ltd.,
Toronto, Montreal.

MILLING ATTACHMENTS
[illegible]

MILLING MACHINES, HAND
[illegible]

MILLING MACHINES, HORIZONTAL AND VERTICAL
[illegible]

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
[illegible]
Hendey Machine Co., Torrington.
[illegible]
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio
[illegible]
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PROFILE
[illegible]
Can. Fairbanks-Morse Co., Montreal.
[illegible]
Garlock Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York
[illegible]
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
[illegible]
Ford-Smith Mach. Co., Hamilton, Ont.
[illegible]
Kempsmith Mfg. Co., Milwaukee, Wis
Tabor Mfg. Co., Philadelphia, Pa.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Cummings & Son, J. W., New Glasgow, Canada
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Marsh & Henderson, Belleville, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal
Cleveland Pneumatic Tool Co. of Canada, Toronto
Jenckes Mach. Co., Sherbrooke, Que.
[illegible]
A. R. Williams Machy. Co., Toronto.

MITTENS
Hockey Steel Grip Glove Co., Chicago, Ill.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
[illegible]
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
[illegible]
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock Walker Machinery Co., Toronto, Ont

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York

MUNITION MACHINERY
[illegible]

MUNTZ METAL
[illegible]

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa
Canadian Art Metal Co., Ottawa, Can

NICKEL SILVER
[illegible]

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont
Landis Machine Co., Waynesboro, Pa

NITROGEN
Canada Welding Co., Toronto, Ont.
Linde Air Products Co., Toronto.

NOSE SOCKETS
[illegible]

NUTS, SEMI FINISH AND FINISHED
Canadian B. & K. Machine Limited, Montreal.
Galt Machine Screw Co., Galt, Ont.
National Acme Co., Cleveland, Ohio
[illegible]

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.
[illegible]

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.
[illegible]

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa

NUT TAPPERS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont
Garvin Machine Co., New York
Greenfield Tap & Die Corp., Greenfield, Mass
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa
National Machy. Co., Tiffin, O.
Pettie of Montreal, Ltd., H. W., Montreal, Que.

OIL, DRAWING
Elm Cutting Oil Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford, Ont
Oven Equipment & Mfg Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Brantford Oven & Rack Co., Brantford, Ont
Oven Equipment & Mfg. Co., New Haven, Conn.

OXY-ACETYLENE WELDING AND CUTTING
Can. Welding Works, Montreal, Que.
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.

PACKINGS, ASBESTOS
Bennett, W. P., 51 Montford St., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
New Britain Mach. Co., New Britain, Conn.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Worcester, Mass
William R. Perrin, Ltd., Toronto.
Pettie, Ltd., H. W., Toronto, Ont

PAPER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon, Holmes & Co., Sherbrooke, Que
Stuttevant Co., B. F., Galt, Ont

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont
Fox Machine Co., Jackson, Mich.
Garlock Walker Machinery Co., Toronto, Ont

PATENT SOLICITORS
Bodden, Hanbury, A., Montreal
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto

PATTERNS
Winnipeg Gear & Engr. Co., Winnipeg, Man

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton.

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PIPE CUTTING AND THREADING MACHINES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn
Ross & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock Walker Machinery Co., Toronto, Ont
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Pettie, Ltd., H. W., Toronto, Ont
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

PIPE RIVETED STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
John H. Hall & Sons, Ltd., Brantford, Ont.
Pettie of Montreal, Ltd., H. W., Montreal, Que
Wells Bros. Co. of Canada, Galt, Ont.

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks Morse Co., Montreal.
The Geo. P. Ross Mchy. & Supply Co., Montreal
Gardner, Robt., & Son, Montreal.
Garlock Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles Bement-Pond Co., New York.
Pettie of Montreal, Ltd., H. W., Montreal, Que
Pettie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks Morse Co., Montreal.
The Geo. P. Ross Mchy. & Supply Co., Montreal
Garlock Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles Bement-Pond Co., New York.
Pettie, Ltd., H. W., Toronto, Ont.
Pettie of Montreal, Ltd., H. W., Montreal, Que
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Niles Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn

PRESSES, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich
Toledo Machine & Tool Co., Toledo.

PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
The Geo. P. Ross Mchy. & Supply Co., Montreal
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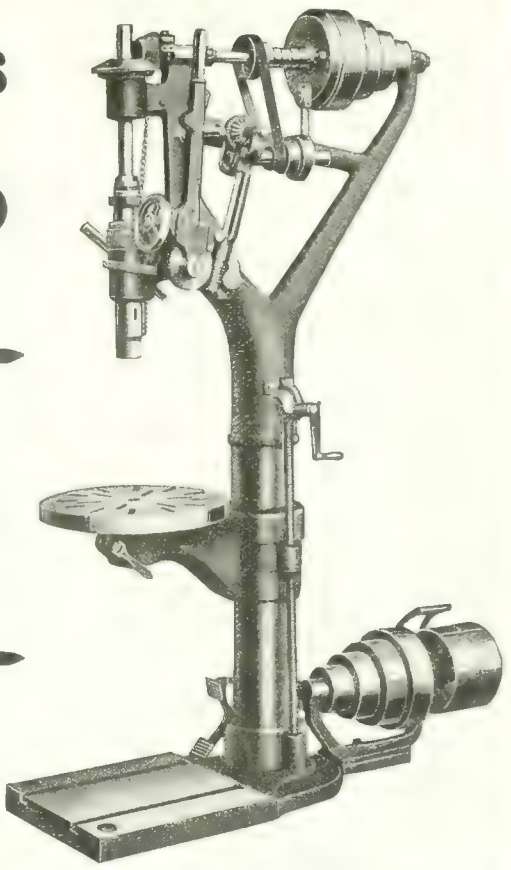

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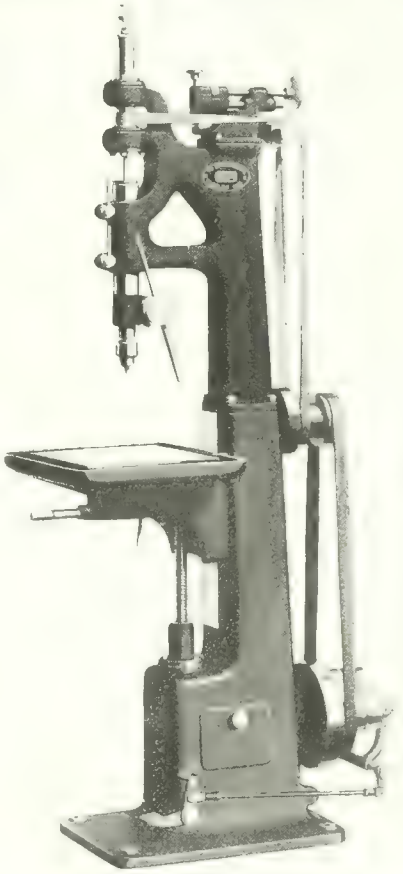

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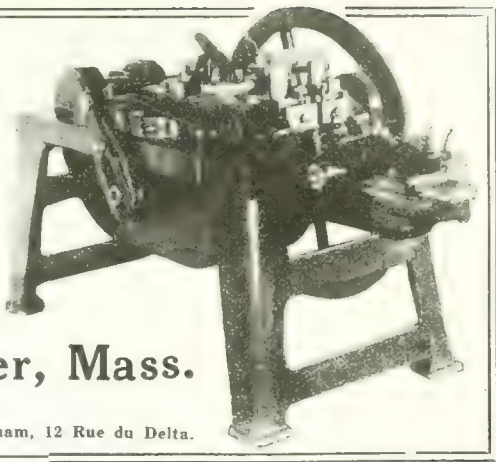

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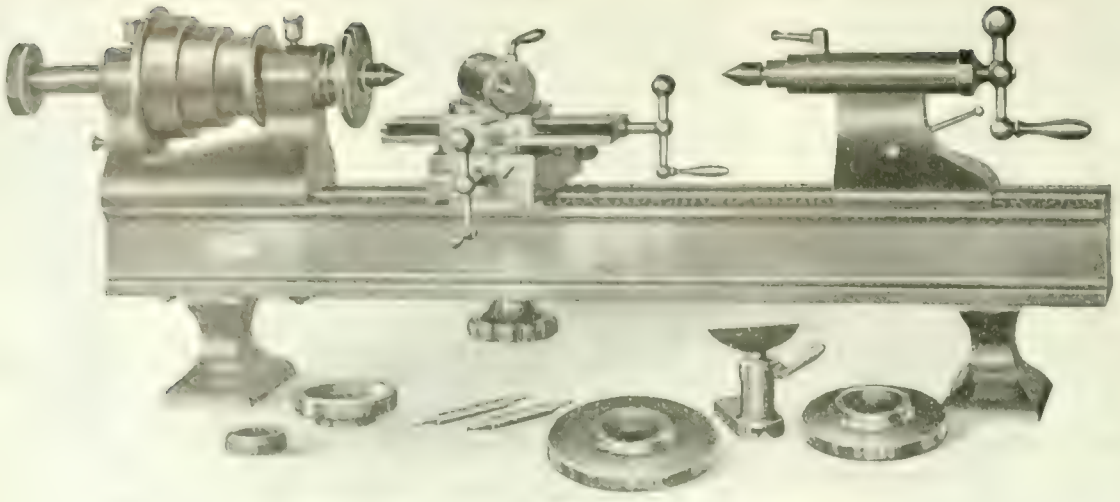

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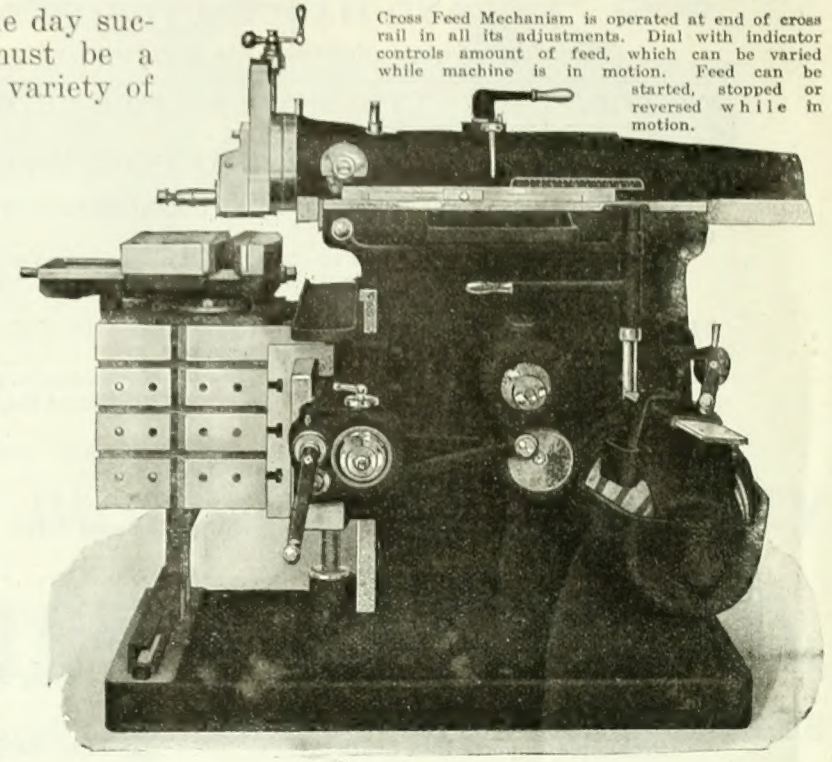

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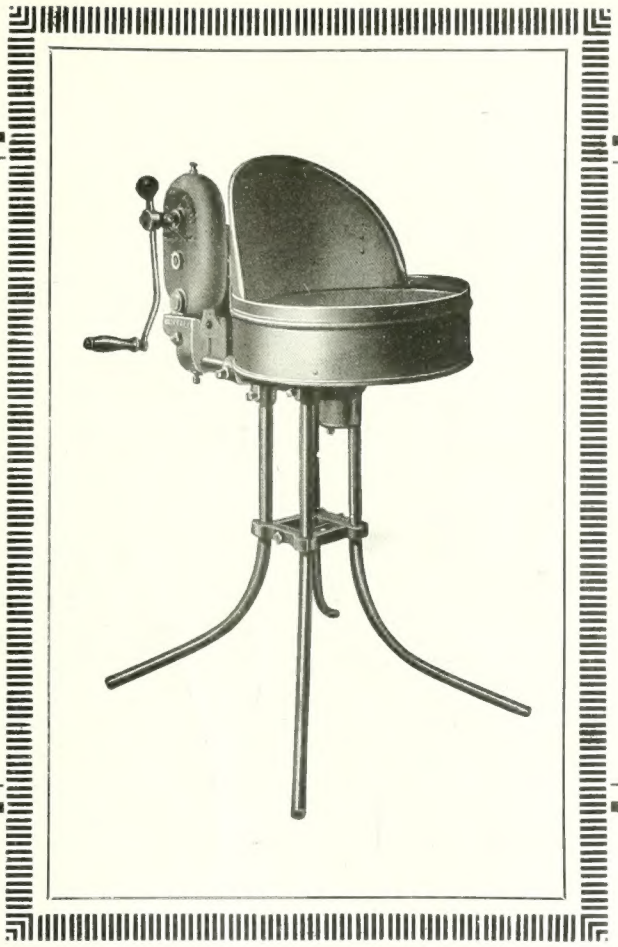

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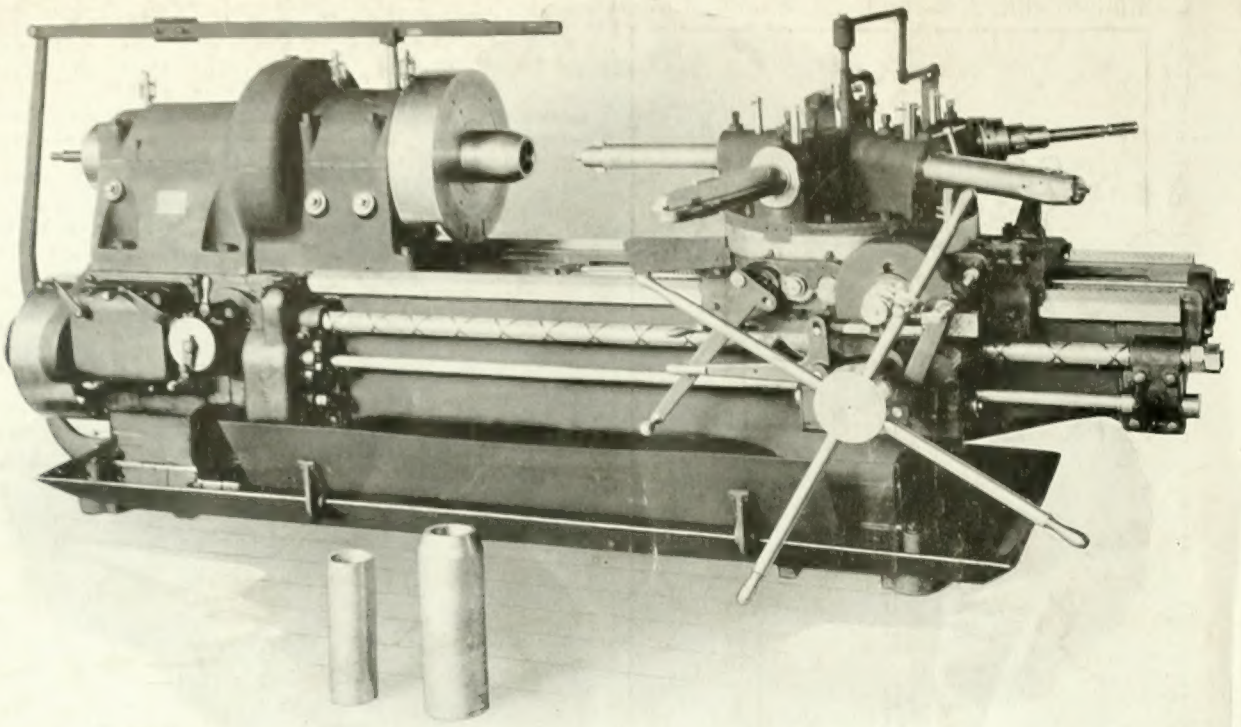

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